Alignment Files

An alignment defines the route of a road, utility line, water way, etc., and is typically comprised of both horizontal and vertical elements. Also, an alignment may include cross-sectional information. This chapter describe creating alignments and how alignments are used in 3D-Office,

Importing and Opening an Alignment

3D-Office opens three dimensional alignment files for viewing and editing horizontal centerlines and vertical profiles, creating and applying templates, viewing a vertical profile or 3D simulation, exporting an alignment, or setting alignment options.

3D-Office imports alignments into 3D Project files from three file types:

- 3D alignment files (*.rd3)
- Pocket-3D controller files
  See “Importing from Pocket-3D” on page 6-2 for details.
- LandXML files
  See “Importing a LandXML Alignment File” on page 6-3 for details.

Importing an Alignment

Follow these steps to import an alignment from a 3D alignment file into a 3D Project file.

1. With a 3D Project open, click **Alignment ▸ Import alignment ▸ From 3D alignment file (*.rd3)**.
2. On the ***Open*** dialog box, navigate to the location of the desired file, select it, and click **Open** (Figure 6-1). The alignment from the selected file is added to the 3D Project file.

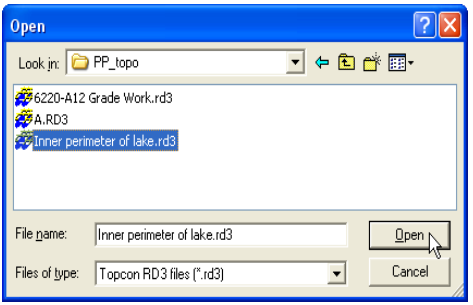

Figure 6-1. Import 3D Alignment File

Importing from Pocket-3D

Follow these steps to import an alignment from a Pocket-3D controller into a 3D Project file.

1. Connect the Pocket-3D controller to the computer and turn on the controller. See Appendix A for details. Run Pocket-3D on the controller.
2. With a 3D Project open, click **Alignment ▸ Import alignment ▸ From Pocket-3D controller**. 3D-Office connects with the Pocket-3D controller and retrieves alignment files.
3. On the ***Pocket-3D files*** dialog box, select the file to import and click **Open** (Figure 6-2 on page 6-3). The file type is automatically selected. The alignment information from the selected file is added to the 3D Project file.

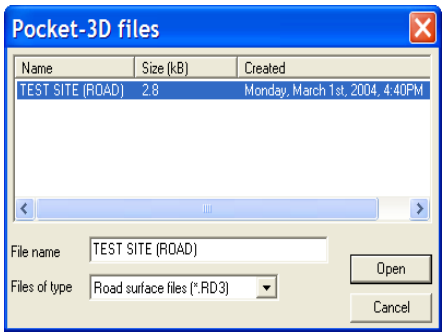

Figure 6-2. Select and Open Pocket-3D Alignment File

Importing a LandXML Alignment File

Follow these steps to import an alignment from a LandXML file into a 3D Project file.

1. With a 3D Project file open, click **Project ▸ Import alignment ▸ From LandXML file**.
2. On the ***Open*** dialog box, navigate to the location of the desired file, select it, and click **Open** (Figure 6-3).

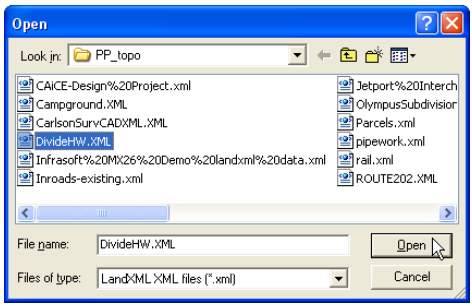

Figure 6-3. Open LandXML File

3. On the ***Import LandXML alignment(s)*** dialog box, select the desired alignment(s) (Figure 6-4 on page 6-4).
   - Click the desired alignment(s).
     Hold down the **Shift** key to select groups of alignments. Hold down the **Ctrl** key to select separate alignments.

- Click **Select All** to select all available alignments. The button becomes a Select First button to select only the first alignment.
  When selecting all alignments, any cross-section surfaces associated with the selected alignments will display in the bottom pane.

4. If the alignment selected in the top pane contains cross-section surfaces, click **Import <CrossSectionSurf> as TIN surfaces** to select/de-select the desired surfaces in the bottom pane.

   By default, all cross-section surfaces will be imported as TIN surfaces. Uncheck the box to prevent the surface from being imported.

   The selected alignments from the LandXML file are added to the 3D Project file.

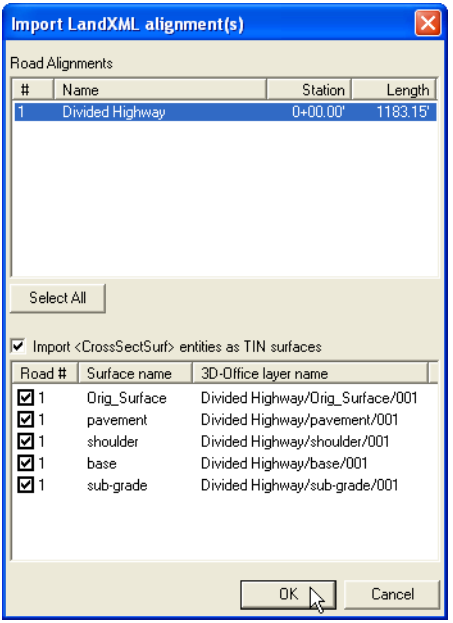

Figure 6-4. Select LandXML Alignment(s)

Importing Alignment Features

A 3D Project file can import horizontal centerlines, vertical profiles, and cross sections from other files types.

To import a horizontal centerline, click Alignment ▸ Import alignment ▸ Horizontal centerline ▸ From CLIP file (*.plt). Navigate to and select the *.plt CLIP file and click **Open**.

To import a vertical profile, click Alignment ▸ Import alignment ▸ Vertical profile ▸ From CLIP file (*.alz). Navigate to and select the *.alz CLIP file and click **Open**.

To import a cross section, click Alignment ▸ Import alignment ▸ X-section ▸ <file type>. Navigate to and select the desired file and click **Open**. Cross sections can be imported from ISPOL files (*.sc1), CLIP files (*.trv), and InRoads files (*.soe).

Opening an Alignment in 3D-Office

1. Click **File ▸ Open** to open a 3D alignment file.
2. On the ***Open*** dialog box, navigate to the location of the file, select the file type as Alignment (*.rd3), select the desired file, and click **Open** (Figure 6-5).

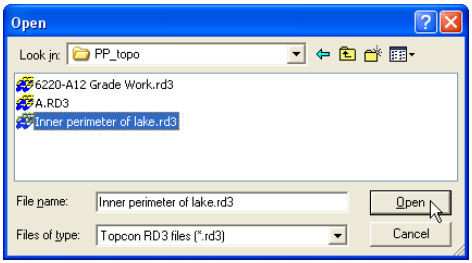

Figure 6-5. Open 3D Alignment File

Opening a Pocket-3D Alignment File

If a Pocket-3D controller is connected to a computer, 3D-Office can open alignment files directly from the controller. Once opened, the file can be exported to other files or saved to the computer.

1. Connect the Pocket-3D controller to the computer and turn on the controller. See Appendix A for details.
2. Click **File ▸ Open Pocket-3D file**.
3. On the ***Pocket-3D files*** dialog box, select the file type (*.rd3) and the desired file, then click **Open** (Figure 6-6). The Pocket-3D alignment file opens in 3D-Office.

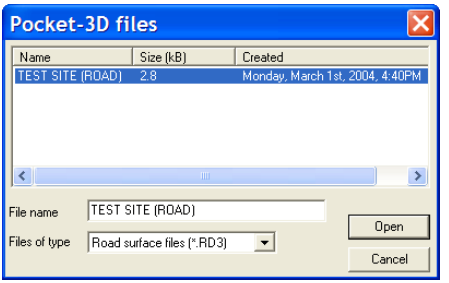

Figure 6-6. Select File and Click Open

Creating and Editing an Alignment in a 3D Project File

The following sections give details on creating an alignment in a 3D Project file using imported linework or user-drawn polylines. Steps for creating and applying basic road templates are also given.

A layer must exist before creating an alignment. See “Managing Layers” on page 2-5 for layer information.

Creating a Polyline

An alignment can be created from either a newly drawn polyline or imported linework.

- If drawing a polyline, see “Creating Linework” on page 4-5.
- If importing linework, see “Importing and Opening Linework” on page 4-1.

1. With the selection tool, select the polyline or linework and click **Linework ▸ Convert polyline(s) to alignment**.
2. Enter a name for the new alignment and the connectivity tolerance for multiple polylines, then click **OK** (Figure 6-7). Selected polylines whose end points are within the tolerance from each other will be linked in the new alignment definition.

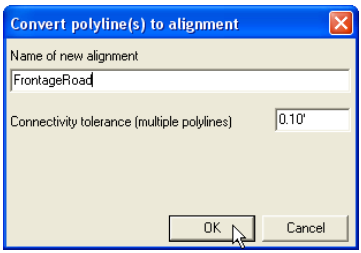

Figure 6-7. Set New Alignment Parameters

Creating Feature Line Templates

1. Click **Alignment ▸ Templates** and click **Add** on the *Road templates* dialog box (Figure 6-8).

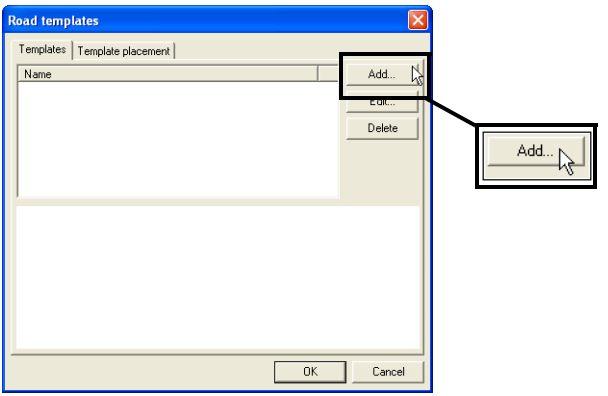

Figure 6-8. Add Feature Line Template

2. Enter a name for the template and click **Add** on the ***Edit template*** dialog box. Select the first element type as *Offset from CL*, enter the *H.Dist* and *V.Dist* values, and click **OK** (Figure 6-9).

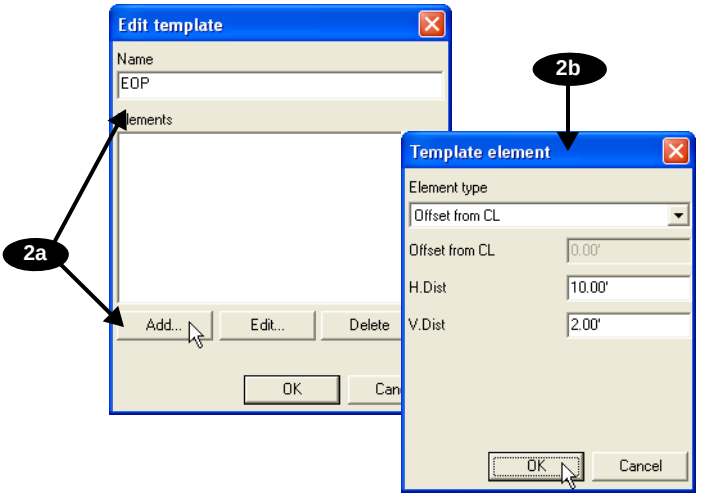

Figure 6-9. Set First Template Element

3. Click **Add** to enter further elements, selecting from the Grade, H.Dist & V.Dist, Curb, and Side slope as needed (Figure 6-10). Click **OK** to save the element.

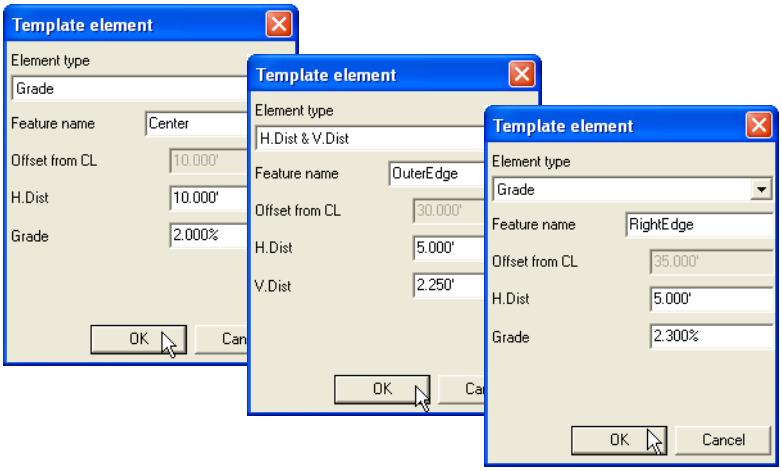

Figure 6-10. Add Templates Elements

4. Click **OK** to save template. Click **OK** again to save the template to the file (Figure 6-11).

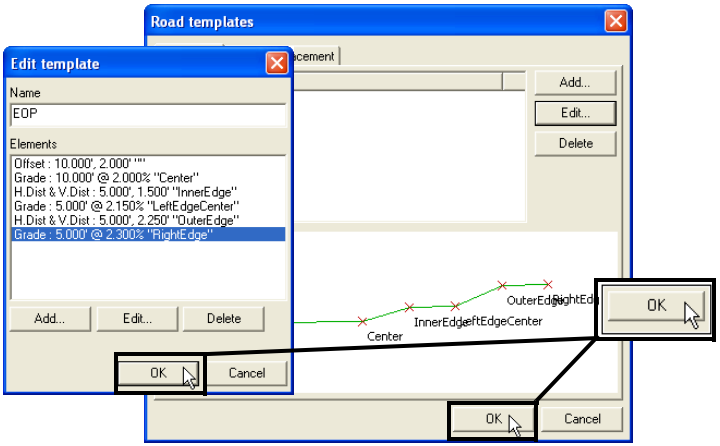

Figure 6-11. Save Template

Placing a Road Template

1. Click **Alignment ▸ Templates** and click the Template placements tab. Then click **Add** (Figure 6-12).

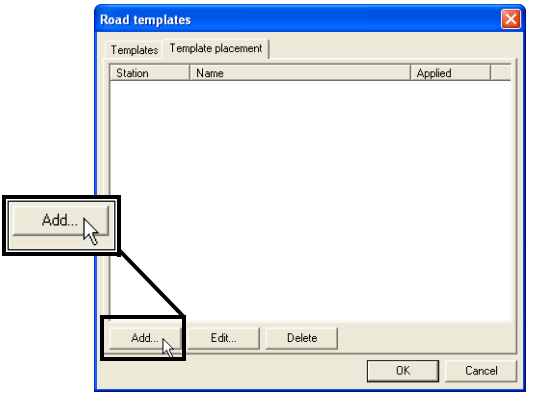

Figure 6-12. Place Road Templates

2. Select the *Template*, the *Side of centerline to apply it to*, and the *Station* to start at. Then click **OK** (Figure 6-13).

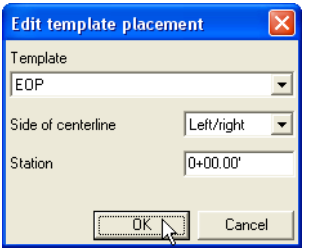

Figure 6-13. Apply Template to Centerline

3. Click **OK** on the ***Road template placement*** dialog box to place the template and view the result on the Plan View (Figure 6-14 on page 6-11). If needed, set view options to view template information (see “Setting View Options” on page 6-38 for details).

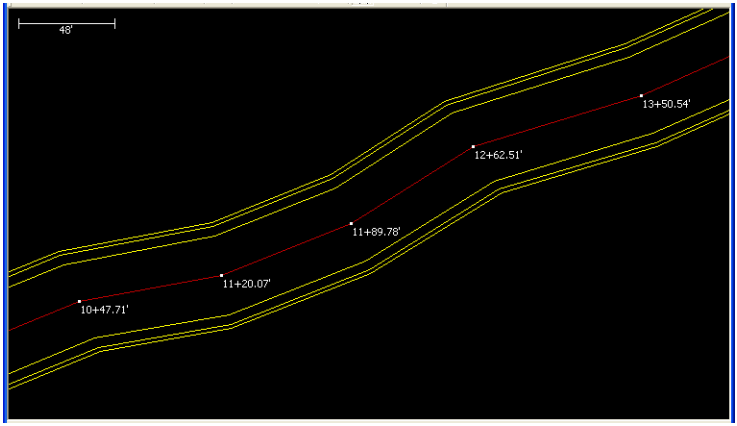

Figure 6-14. Alignment with Templates

Editing Templates

1. Click **Alignment ▸ Templates**.
2. Select the template and click **Edit**.
3. Click **Add** to add more elements, or select an element and click **Edit** to change its parameters.
4. When finished, click **OK** until the main screen appears. The changes are automatically applied to the alignment file.

Using Multiple Templates

Use multiple templates for a complicated project with frequent or sudden changes—for example, when the road narrows and widens at spots along the way, or in grade changes.

1. Follow the steps in “Creating Feature Line Templates” on page 6-8 for each new template.
2. When finished, apply the templates as seen in “Placing a Road Template” on page 6-10.

All templates within a single alignment must have the same number of elements on the respective road sides.

Viewing and Editing Alignments

To view an existing alignment in a 3D Project, click **Alignment ▸ Alignments**. The ***Alignments*** dialog box (Figure 6-15) lists all existing alignments in the 3D Project.

- Select an alignment to view its name, layer information, and station properties in the lower part of the dialog box.
- Click OK to display the selected alignment in the plan view.

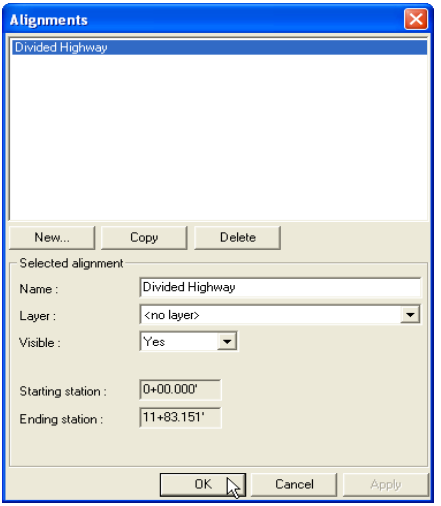

Figure 6-15. Alignments in 3D Project

The Alignments option is only available in 3D Project files, not 3D Alignment files.

Copying an Alignment

The copy function is useful for creating a new alignment that has components common to an existing alignment.

Selecting an alignment and clicking **OK** will display that version on the Plan View. From there, the current alignment can be edited and exported for use in other files.

1. On the ***Alignments*** dialog box, select the alignment to copy and click **Copy** (Figure 6-16).
2. Type a unique name for the new alignment and press **Enter** or click elsewhere on the screen (Figure 6-16).

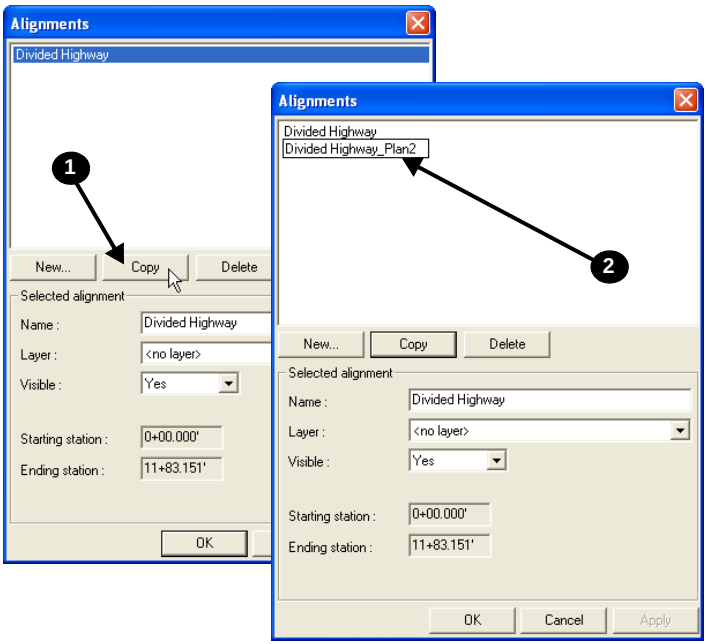

Figure 6-16. Copy and Name Alignment

3. Make layer and visibility changes to the selected, new alignment as applicable. Or rename it if needed.
4. If needed, select the new alignment and click **OK** to view it on the Plan View.

Deleting an Alignment

Only delete an alignment when the data it contains will never be needed again. If necessary, save a backup copy of the file before deleting alignments.

NOTICE

Deleting an alignment will also delete all of its contents.

1. On the ***Alignments*** dialog box, select the alignment to delete and click **Delete** (Figure 6-17).
2. Click **OK** to confirm the deletion (Figure 6-17).

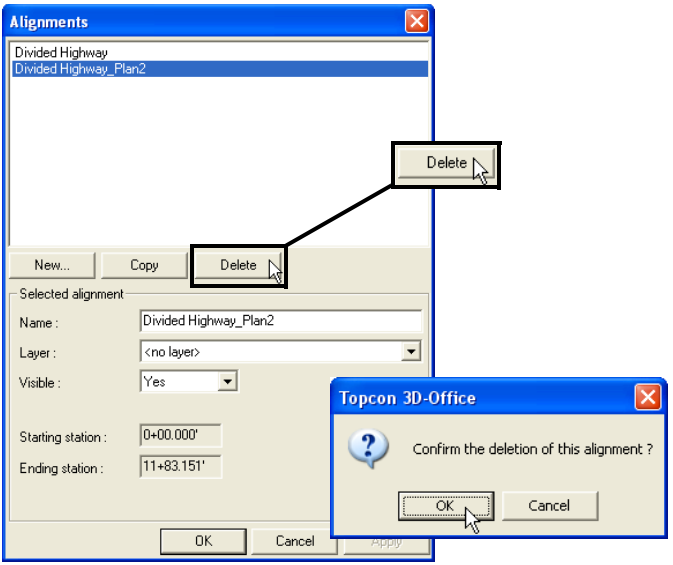

Figure 6-17. Delete Alignment

To undo the deletion, click **Edit ▸ Undo edit alignments** or press **Ctrl+Z**.

Horizontal Elements

Horizontal elements define the location of the alignment in the horizontal plane. Horizontal elements consist of straight segments, curves, and spiral curves. Each segment has an associated beginning and ending station, beginning and ending coordinates, and curve parameters (if it is a curve).

To view, add, or edit horizontal elements, click **Alignment ▸ Horizontal centerline**. The ***horizontal alignment table*** displays along with the plan view. The table contains the following information about each horizontal element in the alignment file (Figure 6-18 on page 6-16):

- Start station – the starting station of the element
- Element – the element type; either Straight, Curve PC-PT, Spiral TS-SC, or Spiral SC-ST
- Curve Dir – the direction of the curve; either left or right
- Length – the length of the element in the project units
- Radius – the radius of the curve or spiral
- Start E(X), Start N(Y) – the horizontal coordinates of the beginning point of the element
- Start Azi – the starting azimuth (direction) of the element
- End station – the ending station of the element

To import a horizontal centerline, see “Importing Alignment Features” on page 6-5.

Adding a Horizontal Element

When selecting elements on the ***horizontal alignment table***, fields highlighted in yellow can be edited; fields highlighted in red cannot be edited.

On the ***horizontal alignment table***, click **Add**. The new element is added at the end of the horizontal elements table (Figure 6-18).

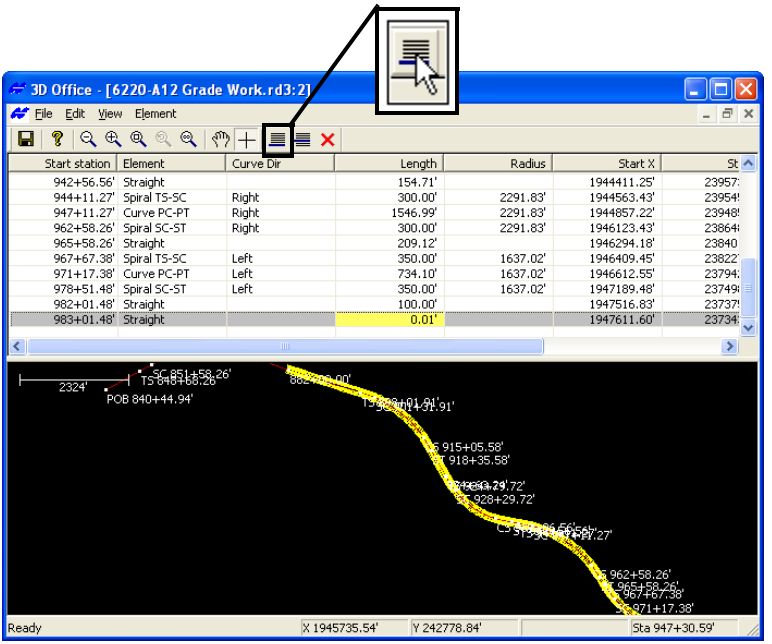

Figure 6-18. Add New Element

See “Editing a Horizontal Element” on page 6-18 for editing the element’s fields.

Inserting a Horizontal Element

An inserted element is placed above the selected element. Inserting an alignment element will affect all elements following the new element.

On the ***horizontal alignment table***, select an element to insert the new element before and click **Insert** (Figure 6-19).

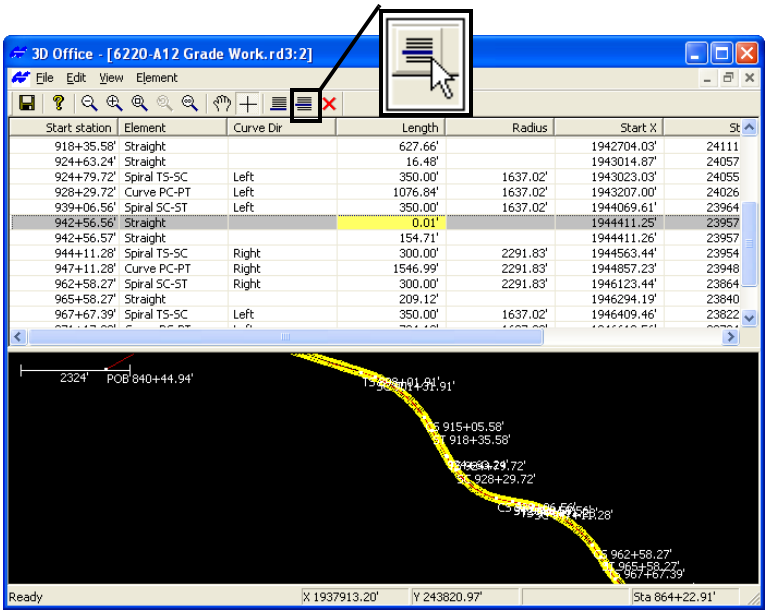

Figure 6-19. Insert New Element

See “Editing a Horizontal Element” on page 6-18 for editing the element’s fields.

Editing a Horizontal Element

The editable cells of the ***horizontal alignment table*** contain either drop-down lists or text entry boxes for editing horizontal element components.

Editable cells highlight in yellow; static cells highlight in red.

Except for the first record, *Start Station*, *Start X*, *Start Y*, and *End station* cannot be directly changed; however, they could be changed indirectly when editing fields they are based on.

To edit a horizontal element, double-click (or select and press **F2**) to place the table cell in edit mode (Figure 6-20).

- For drop-down lists, click the selection. Element types include Straight, Curve PC-PT, Spiral TS-SC, and Spiral SC-ST. Curve directions are either Right and Left.
- For text entry boxes, type the value and press **Enter**.

Any changes are reflected in the plan view below the table.

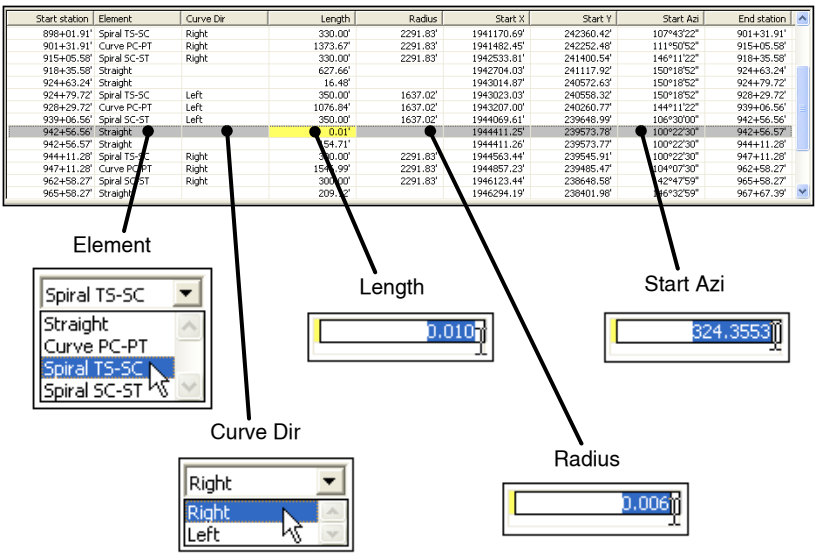

Figure 6-20. Edit Element

Deleting a Horizontal Element

To delete an element from the file, select the desired element from the ***horizontal alignment table*** and click **Delete**, or click **Element ▸ Delete ▸ Current record**. Deleting an alignment element will affect all following elements.

Click **Edit ▸ Undo delete element** to return the deleted element to the list.

Printing Horizontal Elements

When the ***horizontal alignment table*** displays, the File menu contains specific options for previewing and printing the table or graph (Figure 6-21).

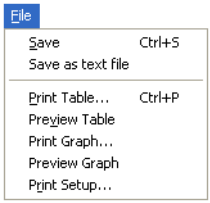

Figure 6-21. File Menu for Horizontal Elements List

Before printing, view the display using the Previews.

Saving the Horizontal Alignment Table as a Text File

The File menu contains an option to save the horizontal elements list as a text file. Click **File ▸ Save as text file**, then save the file to the desired location using the ***Save As*** dialog box.

The text file will include all information shown in the table, as well as the date, file name, and road name.

Vertical Profile Elements

Vertical profile elements define the height component of the alignment. The elements are either constant-grade lines or (parabolic) vertical curves.

To view, add, edit, or copy vertical profiles, click **Alignment ▸ Vertical profile**. The ***vertical profile table*** displays along with the profile view. The table contains the following information about the vertical alignment (Figure 6-22):

- Element – the type of the vertical element
- Sta @ PVI – the station at the point of vertical intersection
- Elev @ PVI – the elevation at the point of vertical intersection
- Curve Length – only for vertical curve elements, the length of the vertical curve
- Grade @ PVT – displays the grade at the point of vertical tangency
- Grade @ PVC – displays the grade at the point of vertical curve

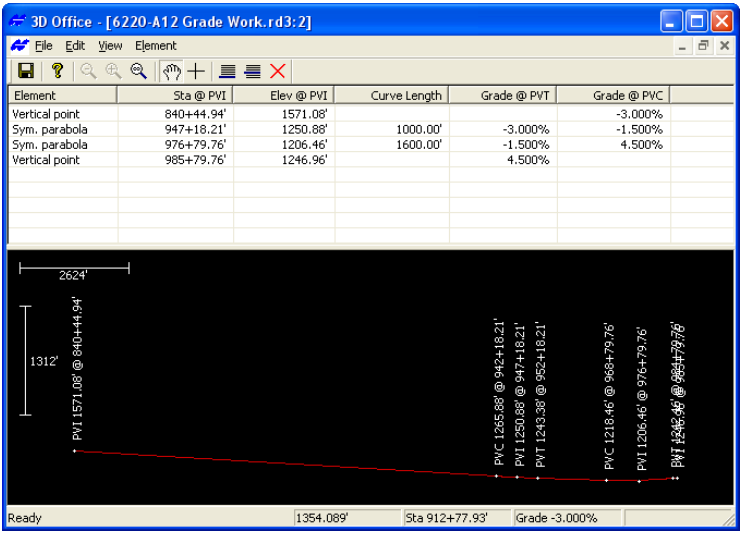

Figure 6-22. Vertical Alignments

To import a vertical profile, see “Importing Alignment Features” on page 6-5.

Adding a Profile Element

When adding a new vertical profile element, 3D-Office places the new record at the end of the table and highlights it for editing.

On the ***vertical profile table***, click **Add**. The new element is added to the end of the table (Figure 6-23).

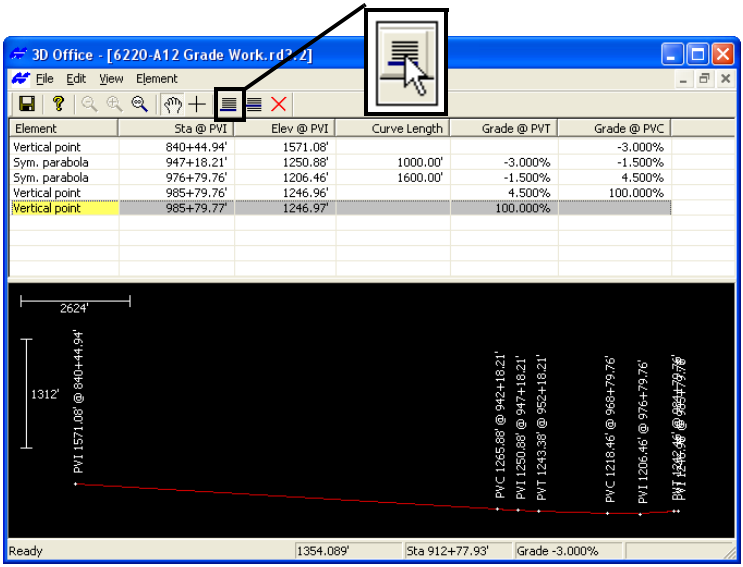

Figure 6-23. Add New Element

See “Editing a Vertical Profile Element” on page 6-23 for editing the element’s fields.

Inserting a Vertical Profile Element

An inserted curve is placed above the curve. Inserting an alignment element will affect all elements following the new element.

On the ***vertical profile table*** window, select an element to insert the new element before and click **Insert** (Figure 6-24).

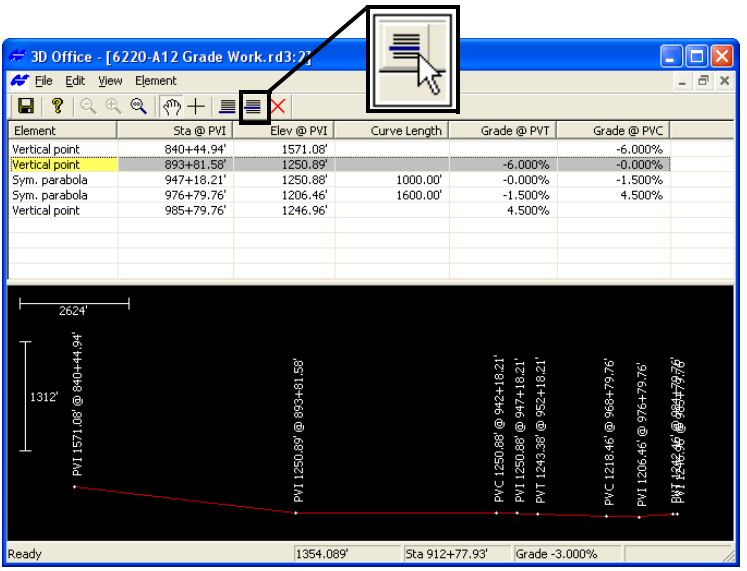

Figure 6-24. Insert New Element

See “Editing a Vertical Profile Element” on page 6-23 for editing the element’s fields.

Editing a Vertical Profile Element

The editable cells of the ***vertical profile table*** contain either drop-down lists or text entry boxes for editing element components.

Editable cells highlight in yellow; static cells highlight in red.

Grade@PVT and *Grade@PVC* cannot be directly changed; however, they can be changed indirectly by editing fields that they are based on.

To edit a vertical profile element, double click (or select and press **F2**) the desired cell to place the cell in edit mode (Figure 6-25).

- For drop-down lists, click the selection. Elements include Vertical point and Sym parabola.
- For text entry boxes, type the value and press **Enter**.

Any changes are reflected in the plan view below the vertical curves table.

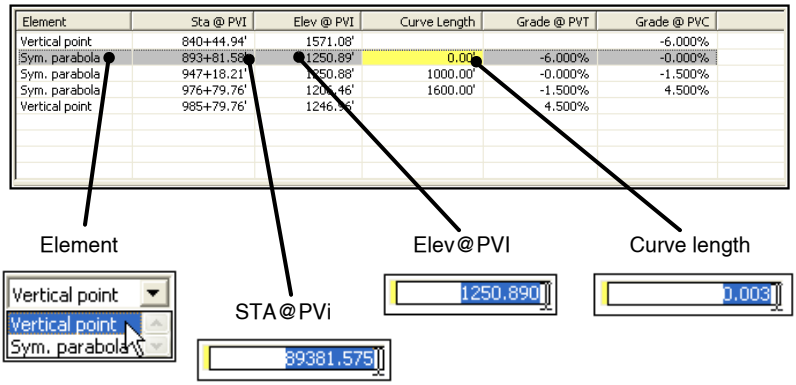

Figure 6-25. Edit Element

Deleting a Vertical Profile Element

To delete an element, select the desired element from the ***vertical profile table*** and click **Delete**, or click **Element ▸ Delete ▸ Current record**. Deleting an element will affect all following elements.

Click **Edit ▸ Undo delete element** to return the deleted element to the list.

Printing Vertical Profiles

When the ***vertical profile table*** window displays, the File menu contains specific options for previewing and printing the table or profile view (Figure 6-26).

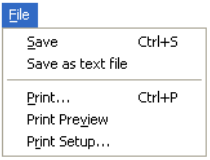

Figure 6-26. File Menu for Vertical Profile View

To print either view, click in the view to make it active, then click **File ▸ Print**.

Before printing, view the display using the Print Preview.

Saving the Vertical Profile Table as a Text File

The File menu contains an option to save the ***vertical profile table*** as a text file. Click **File ▸ Save as text file**, then save the file to the desired location using the ***Save As*** dialog box.

The text file will include all information shown in the table, as well as the date, file name, and road name.

Templates

Templates provide a way to design and view the cross-sectional profile of a road or channel.

To view, add, or edit current road templates, click **Alignment ▸ Templates**. The ***Road templates*** dialog box displays the following information about the available templates (Figure 6-27):

- Name – lists the available templates
- A graphical representation of the selected template

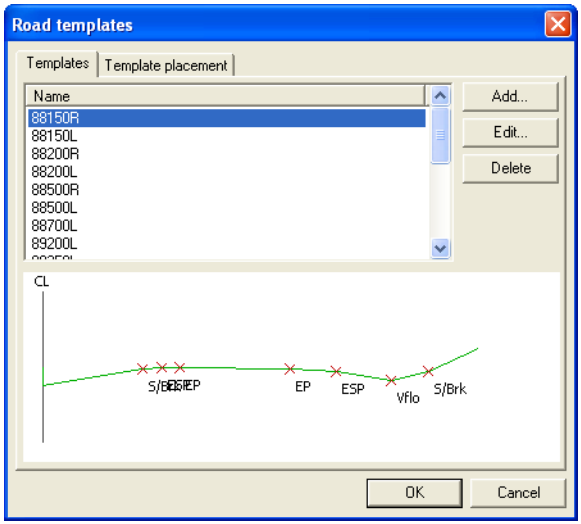

Figure 6-27. Road Templates

Adding a Template

The following procedure create a new template definition. Once added, the template is available to place along the horizontal alignment.

1. On the ***Road templates*** dialog box, click **Add**.
2. Type a name for the new template on the ***Edit template*** dialog box and click **Add** to add elements to the new template (Figure 6-28 on page 6-26).

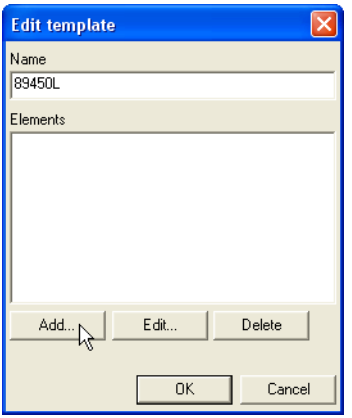

Figure 6-28. Enter Template Name and Add Element

3. On the ***Template element*** dialog box, select the type of element and enter the required information. The fields differ depending on the element selected (Figure 6-29 on page 6-27).
   - Element type – the type of element; either Offset from CL, Grade, H.Dist & V.Dist, Curb, or Side slope
   - Offset from CL – the offset from the centerline; the first element will always have zero for the offset
   - H.Dist – the horizontal distance of the element
   - V.Dist – the vertical height of the element
   - Grade – the grade of the element
   - Curb grade – the curb grade
   - Ditch width – the ditch width
   - Cut slope – the cut slope
   - Fill slope – the fill slope
4. Click **OK** to add the element to the template.

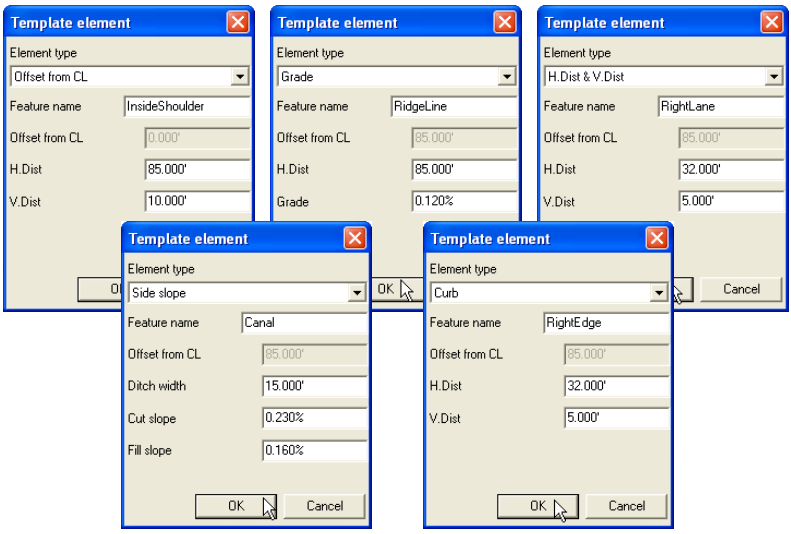

Figure 6-29. Template Element Dialog Boxes

5. To add other elements to the same template, click **Add** on the ***Edit template*** dialog box and repeat steps 3 and 4.
6. Review the elements as needed and click **OK** to add the template to the template list (Figure 6-30).

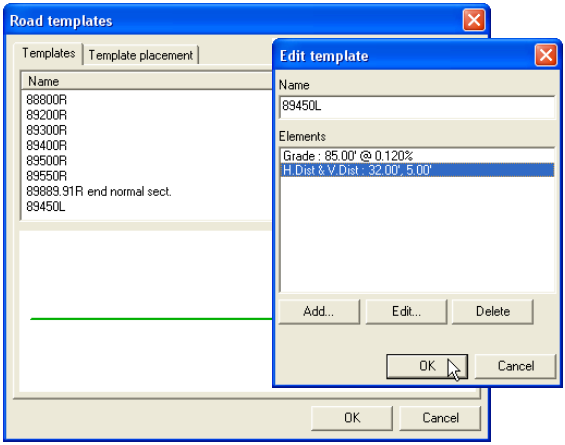

Figure 6-30. Add Template to List

7. Click **OK** on the ***Road templates*** dialog box to apply the changes to the file.

Editing a Template

1. On the ***Road templates*** dialog box, select the desired template to edit and click **Edit**.
2. Select the element to edit and click **Edit** (Figure 6-31).

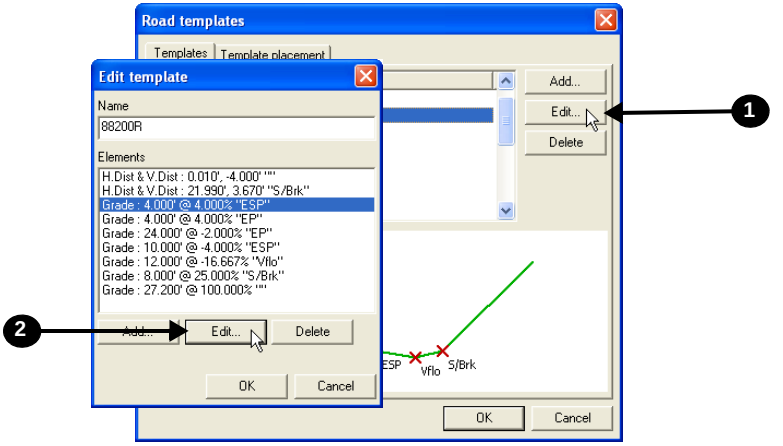

Figure 6-31. Select Template and Element to Edit

3. On the ***Template element*** dialog box, edit the desired parameters and click **OK** (Figure 6-32). The fields differ depending on the element type selected.

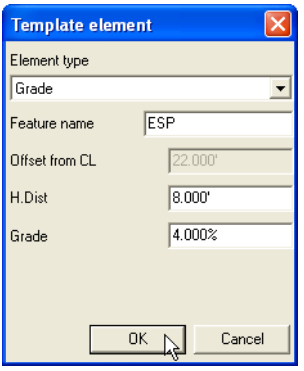

Figure 6-32. Edit Element Parameters and Update Template

4. Click **OK** to update the template. Review the elements as needed and click **OK** to update the template on the template list (Figure 6-33).

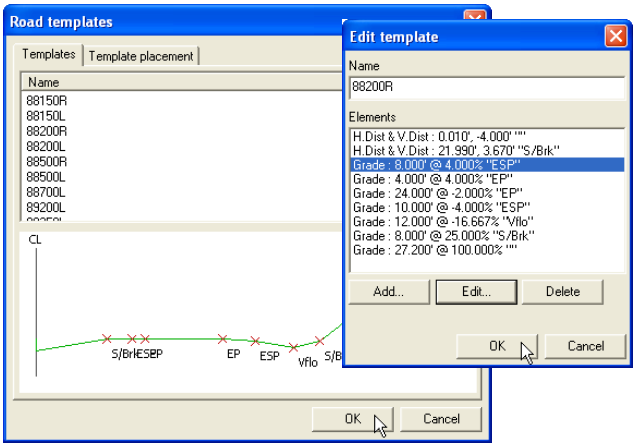

Figure 6-33. Update Template

5. Click **OK** on the ***Road templates*** dialog box to apply the changes to the file.

Deleting an Element

1. To delete an element from a template, select the template and click **Edit**. Then select the element and click **Delete** (Figure 6-34 on page 6-30).
2. Repeat step 1 to delete any other elements in the selected template.
3. Click **OK** to apply the changes to the template, then click **OK** to apply the changes to the file.

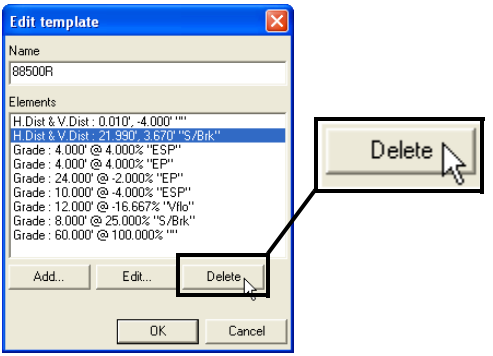

Figure 6-34. Delete Element

Deleting a Template

1. To delete a template, select the desired template and click **Delete** (Figure 6-35).
2. Click **OK** to apply the changes to the file.

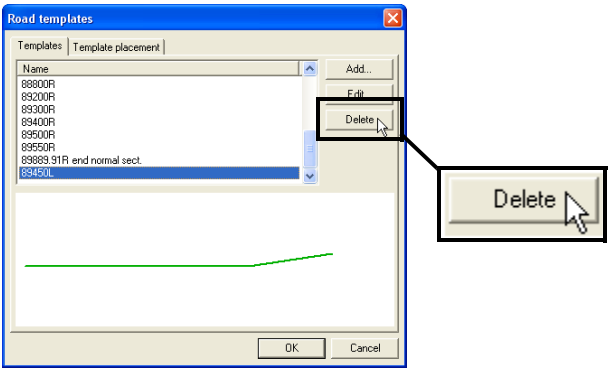

Figure 6-35. Delete Template

Placing a Road Template

Once a template has been created, it is available for placement along the road (alignment). Placing a template along the road defines where the various cross-sectional designs begin and end. See “Templates” on page 6-25 for creating a template.

To view, add, or edit the placement of road templates, click **Alignment ▸ Templates**. The *Templates placement* tab displays the following information about the template used at each station (Figure 6-36):

- Station – the station at which the template is placed
- Name – the name of the template used
- Applied – the side to which the template is applied; either Left, Right, or Left/right of the alignment; left and right are based on the direction of increasing stationing

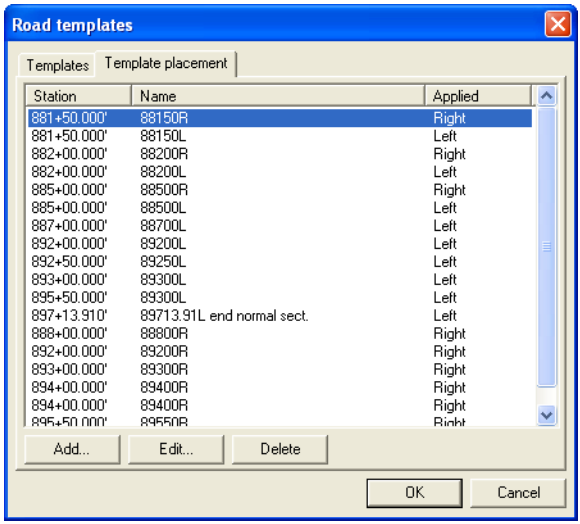

Figure 6-36. Road Template Placement

Adding a Road Template Placement

1. On the *Template placement* tab, click **Add**.
2. Select and enter the following on the ***Edit template placement*** dialog box and click **OK** (Figure 6-37):
   - Select a *Template*.
   - Select the *Side of centerline* to apply the template to, either Left, Right, or Left/right
   - Enter the *Station* value. Enter the value as a single number, 3D-Office will automatically convert to the station type (selected on the ***Units*** dialog box). See Figure 6-37 for an example.

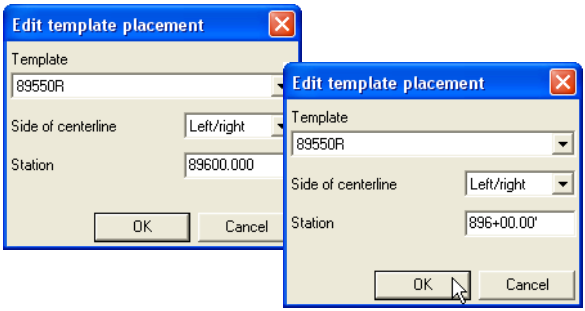

Figure 6-37. Enter Template Placement Information

3. Click **OK** on the ***Road template placement*** dialog box to apply the changes to the file.

Editing a Road Template Placement

1. On the *Template placement* tab, click **E**dit.
2. Edit the desired information on the ***Edit template placement*** dialog box and click **OK** (Figure 6-38):
   - Select a *Template*.
   - Select the *Side of centerline* to apply the template to, either Left, Right, or Left/right
   - Enter the *Station* value. Enter the value as a single number, 3D-Office will automatically convert to the station type (selected on the ***Units*** dialog box). See Figure 6-37 on page 6-32 for an example.

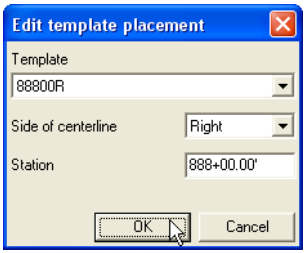

Figure 6-38. Enter Template Placement Information

3. Click **OK** on the ***Road template placement*** dialog box to apply the changes to the file.

Deleting a Road Template Placement

1. To delete a template placement, select the desired template placement on the ***Road template placement*** dialog box and click **Delete**.
2. Click **OK** on the ***Road template placement*** dialog box to apply the changes to the file.

Viewing a 3D Simulation of the Alignment

The 3D views in 3D-Office use lines and colors to give a three-dimensional perception of a field or pad on a two-dimensional screen. Using the 3D view will help you to visualize what the project terrain looks like. Any changes made in this view using the Road options menu selection will also be saved in the Plan view.

To view a wireframe simulation of the alignment, click **Alignment ▸ View 3D simulation ▸ Wire frame**. A new window opens displaying an interactive, 3-dimensional simulation of movement along the alignment (Figure 6-39). For wire frame simulations, lines mark the centerline, horizontal alignments, vertical curves, and stations.

- The arrow keys on the keyboard control the motion of the machine: up arrow is forward/go, down arrow is slow down/stop.
- Use the **Alignment ▸ Options** menu to set the type of machine used in the simulation and simulation steering details (see “Setting View Options” on page 6-38 for details).
- See “3D-view and Profile View Toolbars” on page 1-14 for details on the 3D-view toolbar.

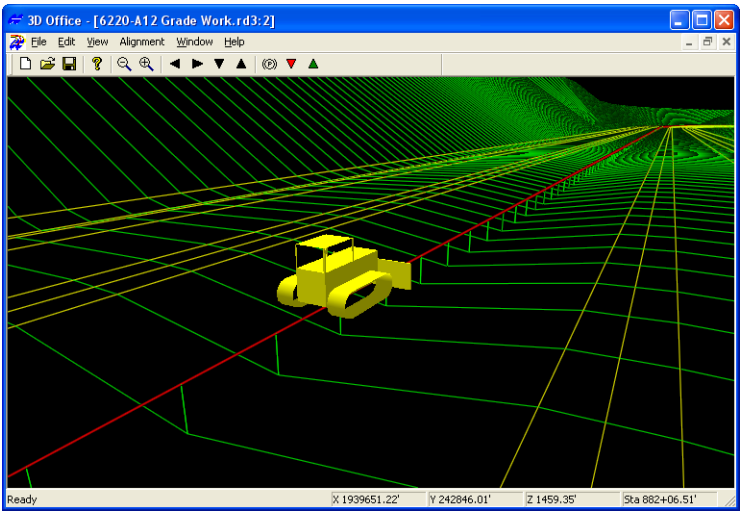

Figure 6-39. Alignment Simulation – Wire Frame

To view a solid model simulation of the alignment, click **Alignment ▸ View 3D simulation ▸ Solid model**. A new window opens displaying an interactive, 3-dimensional simulation of movement along the alignment (Figure 6-40).

- Click and hold on the screen to have the pointer rotate the view.
- The arrow keys on the keyboard control the motion of the machine: up arrow is forward, down arrow is backward, left and right arrows rotate the "ground" accordingly.
- On a mouse with a scroll wheel, the scroll wheel zooms in/out.
- Use the View menu to display contour or grid lines, the road alignment, or a cross section of the road.
- Use the **View ▸ Options** menu to set grid and contour intervals.
- See "3D-view and Profile View Menu Bars" on page 1-13 for details on the menus and menu items.
- See "3D-view and Profile View Toolbars" on page 1-14 for details on the 3D-view toolbar.

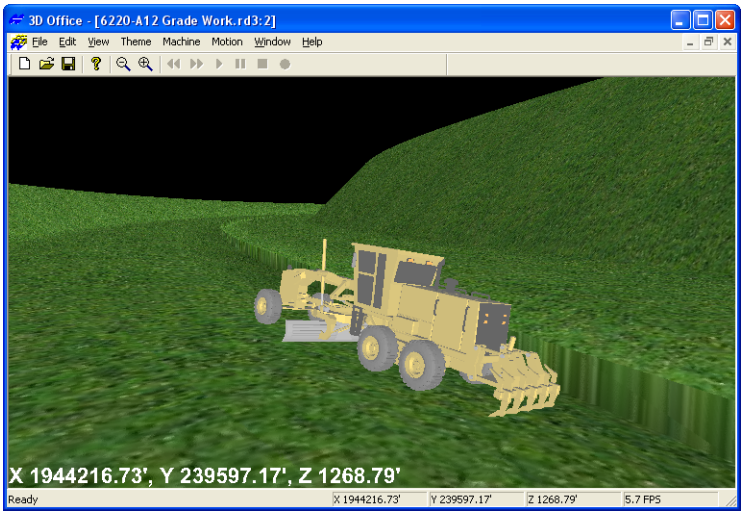

Figure 6-40. Alignment Simulation – Solid Model

Viewing a Profile of the Alignment

The profile view is a powerful tool for visualizing cut and fill heights along a line through the alignment (road surface) and can be used for the following:

- to check clearances between the design surface and existing gas lines, or other utility lines, of known depth
- to determine the grade of the design or existing surface along a line

The profile can be viewed statically or dynamically by dragging the profile line across the field.

1. To view a profile of the field, click **Alignment ▸ View profile**. A check mark displays next to the menu option.
2. In the Plan View, click a location at which to begin the profile. Stretch the line across the field and click once to end it (Figure 6-41).

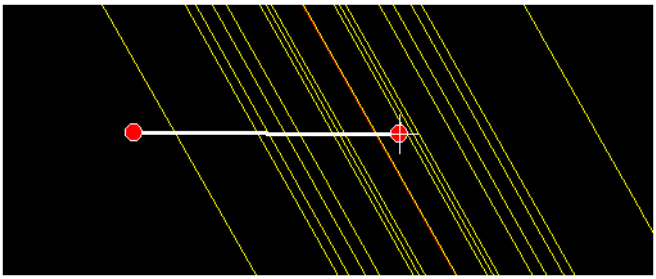

Figure 6-41. Select Area to View in Profile

The Profile View displays (Figure 6-42) the following information:

- elevation tic marks on the left of the view window
- a cross section of the current TIN
- a pop-up box showing XY point coordinates, TIN Z coordinates, and grade at the point of the crosshair
- a horizontal scale bar

- cross hair coordinates in the status bar

  The vertical exaggeration is shown as a ratio next to the elevation in the status bar on the far right.

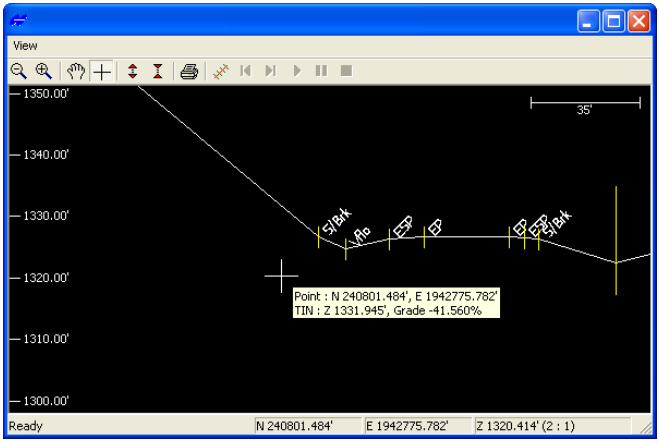

Figure 6-42. Profile View

3. On the ***View*** dialog box (Figure 6-42), use the toolbar to manipulate the view. See "3D-view and Profile View Toolbars" on page 1-14 for information on the toolbar buttons.
4. To change the position of the profile view, click in the Plan View, then click, "grab" and "drag" the start or end point of the profile line in the Design View to a new position. The "grabbed" point is green while being moved. The Profile View changes accordingly.

   Or, you can "grab" the line and shift it without changing its direction or length.

Closing the Profile View quits the profile function. Repeat steps 1 through 3 to display the profile view again.

5. To quit this function, press **Esc**.

Setting View Options

The ***Road options*** dialog box sets the parameters to use for the various alignment views (plan view, profile view, simulation view).

1. Click **Alignment ▸ Options**.
2. On the *Plan view* tab, select the desired parameters (Figure 6-43).
   - Enable or disable *Show road feature lines*, *Show horizontal transition points*, and *Show vertical transition points* as needed.
   - Enable *Show regular station lines at intervals of* to display station lines at a certain interval along the route. Enter the interval in the field provided.

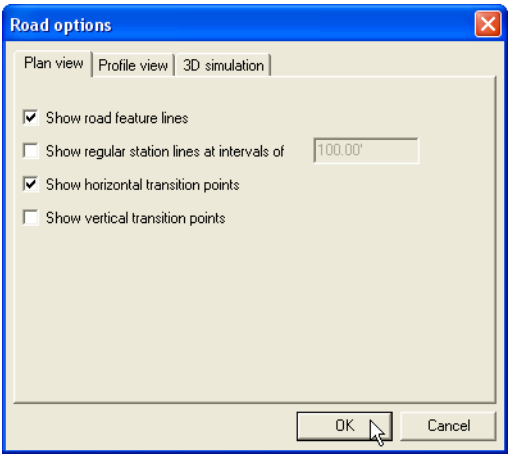

Figure 6-43. Set Plan View and Profile View Options

3. Click the *Profile view* tab and select the desired parameters (Figure 6-44 on page 6-39).
   - Enable or disable the *Show vertical transition points*, *Show vertical transition point labels*, and *Show tangent lines* as needed.
   - Enter a *Default vertical scale exaggeration factor* to set the amount the vertical scale is magnified as compared to the horizontal scale.

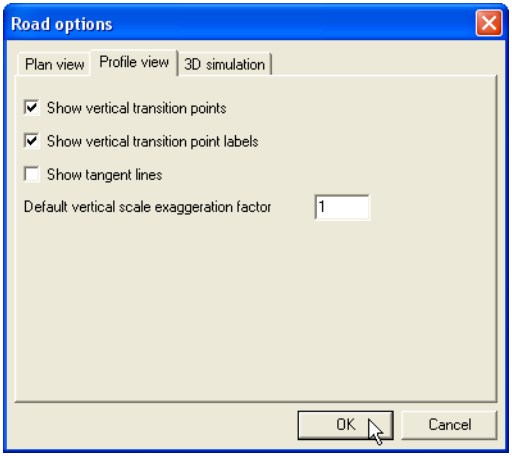

Figure 6-44. Set Plan View and Profile View Options

4. Click the *3D simulation* tab and select the desired parameters for wire frame simulations (Figure 6-45 on page 6-40).
   - Select the *Machine type*, either Bulldozer, Motor grader, or 3-track curb machine.
   - Select the *Road feature to steer to* and the *Machine steering point*.
   - Select either *Start simulation at start of road* or *Start simulation at specific station along road*. If starting at a specific station, enter the station number.
   - Select either *Travel in direction of increasing stations* or *Travel in direction of decreasing stations*.
   - Enable *Loop indefinitely* to have the simulation restart when the virtual machine reaches the end of the road.

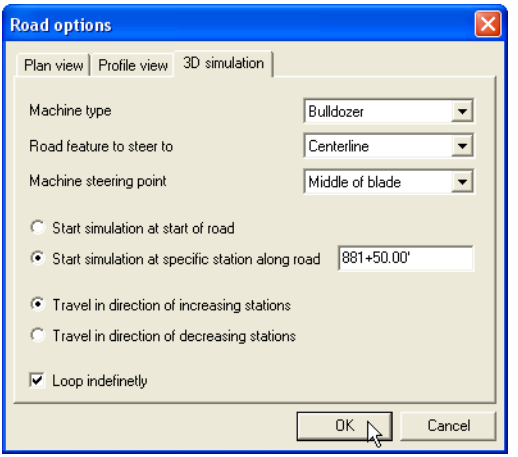

Figure 6-45. Set 3D Simulation View Options

5. Click **OK** to apply the view options to the alignment file.

Setting Unit Options

The ***Project options*** dialog box sets the type of units to use for various quantities and is the same as for 3D Project files. See "Setting Project Units" on page 2-15 for details on the *Units* tab.

Exporting an Alignment

If you made changes to an alignment, you can export the modified alignment to a new alignment file or overwrite a current file with the new information.

Export versions of the file to track progress.

Exporting to an Alignment File

1. With a 3D Project file open, click **Alignment ▸ Export current alignment ▸ To 3D alignment file (*.rd3)**.
2. On the ***Save As*** dialog box, do one of the following (Figure 6-46):
   - To export to another alignment file, navigate to the location of the file and select it, then click **Save**. This will overwrite the content of the existing file.
   - To save to a new file, navigate to the desired folder, type a name for the new file, and click **Save**.

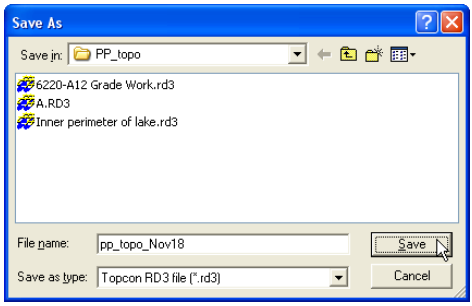

Figure 6-46. Save Alignment File

The selected alignment overwrites the existing file or creates a new alignment file.

Exporting to a Pocket-3D Controller

To use the alignment file in the field, export it to a Pocket-3D controller.

1. Connect the Pocket-3D controller to the computer and turn on the controller (see Appendix A for details). Run Pocket-3D on the controller.
2. With a 3D Alignment file or 3D Project file open, click **Alignment ▸ Export alignment ▸ To Pocket-3D controller** or **Alignment ▸ Export current alignment ▸ To Pocket-3D controller**.
3. On the ***Pocket-3D files*** dialog box, do one of the following and click **Save** (Figure 6-47):
   - Select an existing file to replace.
   - Enter a new file name or keep the default file name.

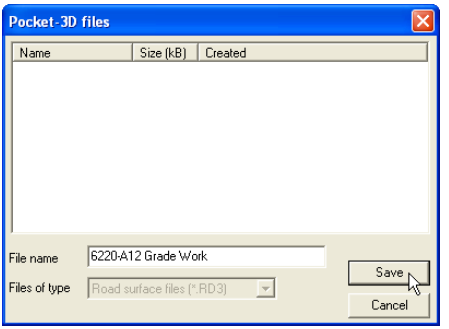

Figure 6-47. Save Alignment to Pocket-3D Controller

Plane Files

A plane file defines a planar surface with a particular location and orientation in three-dimensional space. Planar surfaces are frequently used to define a design surface.

Importing and Opening a Plane Surface

3D-Office opens any three dimensional plane surface file (*.pl3) for setting plane parameters, exporting to another plane surface file, comparing with another plane surface, or setting plane options.

3D-Office recognizes plane surfaces from two file types:

- 3D plane files (*.pl3)
- Pocket-3D controller files
  See “Importing from Pocket-3D” on page 7-2 for import details.

Importing a Plane Surface

Follow these steps to import a plane surface from a 3D plane file into a 3D Project file.

1. With a 3D Project open, click **Plane ▸ Import plane ▸ From 3D plane file (*.pl3)**.
2. On the ***Open*** dialog box, navigate to the location of the desired file, select it, and click **Open** (Figure 7-1 on page 7-2). The plane surface from the selected file is added to the 3D Project file.

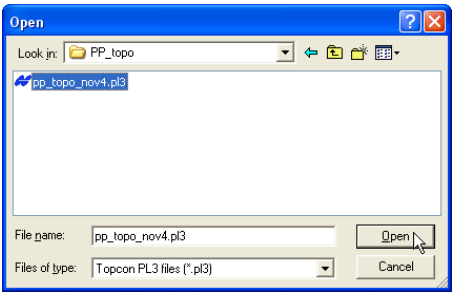

Figure 7-1. Open 3D Plane Surface File

Importing from Pocket-3D

Follow these steps to import a Pocket-3D controller plane file into a 3D Project file.

1. Connect the Pocket-3D controller to the computer and turn on the controller (See Appendix A for details). Run Pocket-3D on the controller.
2. With a 3D Project file open, click **Plane ▸ Import plane ▸ From Pocket-3D controller**. 3D-Office connects with the Pocket-3D controller and retrieves *.pl3 files.
3. On the ***Pocket-3D files*** dialog box, select the file to import and click **Open** (Figure 7-2). The file type is automatically selected. The information from the selected file is added to the 3D Project file.

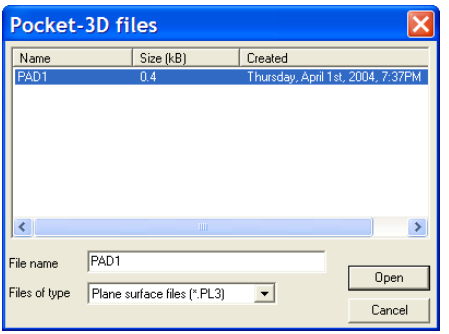

Figure 7-2. Select and Open Pocket-3D Plane File

Opening a Plane Surface in 3D-Office

1. To open a 3D plane file, click **File ▸ Open**.
2. On the ***Open*** dialog box, navigate to the location of the file, select the file type as 3D Plane (*.pl3), select the desired file, and click **Open** (Figure 7-3).

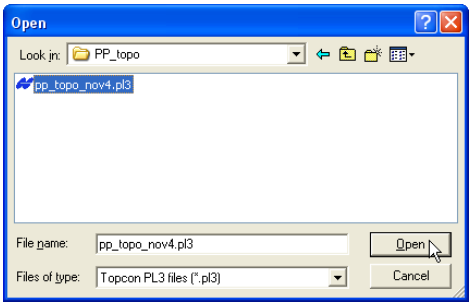

Figure 7-3. Open 3D Plane Surface File

Opening a Pocket-3D Plane File

If a Pocket-3D controller is connected to the computer, 3D-Office can open plane surface files directly from the controller. Once opened, the file can be exported to other files or saved to the computer. See Appendix A for details on connecting a computer and controller.

1. Click **File ▸ Open Pocket-3D file**.
2. On the ***Pocket-3D files*** dialog box, select the file type (*.pl3) and the desired file, then click **Open** (Figure 7-4). The Pocket-3D plane file opens in 3D-Office.

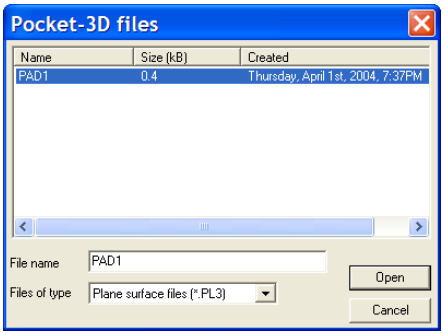

Figure 7-4. Select File and Click Open

Calculating a Plane Surface

When 3D-Office calculates a best-fit plane surface, it produces a single planar surface, based on the input point and line data, that most closely fits the data-point elevations. A best-fit design computation is often a good starting point for a user-customized design. The plane parameters—point on surface, mainfall/crossfall slopes, and boundary—can be easily modified after completing a best-fit computation.

1. If needed, import points into a 3D Project file. Select the desired points from which to create a plane surface (Figure 7-5).
2. Click **Plane ▸ Calculate new plane surface ▸ Best fit through selected points**. 3D office calculates a plane surface and applies a boundary (Figure 7-5).

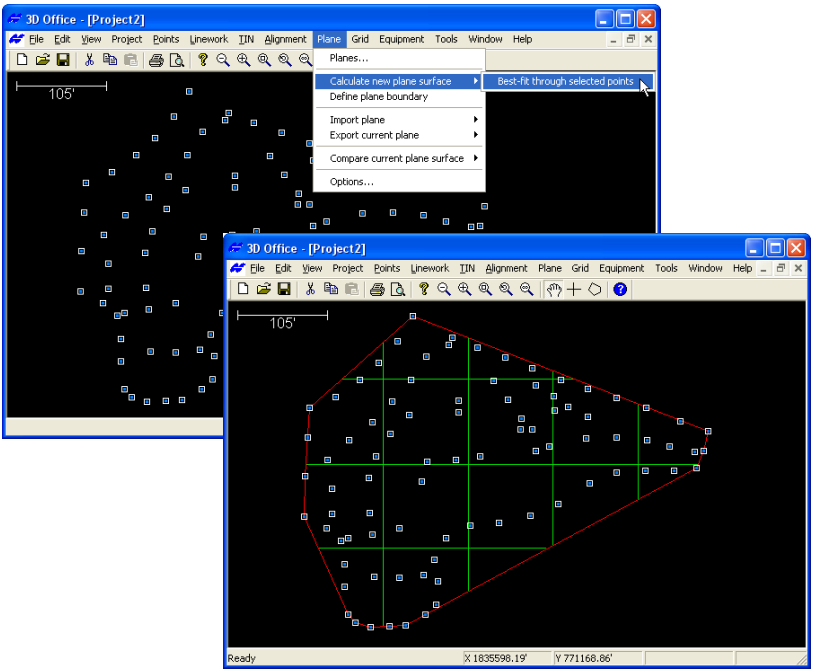

Figure 7-5. Import and Select Points, then Calculate Surface

To edit the main-fall and cross-fall slopes of the plane surface, see “Working with Plane Surfaces” on page 7-5.

Plane surfaces can also be created or copied from existing surfaces using the ***Planes*** dialog box. See "Working with Plane Surfaces" on page 7-5 for details.

Working with Plane Surfaces

Once you have a Plane surface, you can edit it for project requirements. A plane surface can also be compared to other surfaces within the job for volume computation purposes. Making copies of plane surfaces is also useful for project management and design.

The following sections describe:

- Viewing, copying, and deleting existing plane surfaces
- Creating a new plane surface
- Editing plane parameters and defining plane boundaries

Viewing Plane Surfaces

To view the plane surfaces in a 3D Project file, click **Plane ▸ Planes**. The ***Planes*** dialog box displays the following information about the selected plane surface (Figure 7-6 on page 7-6):

- Plane surfaces – a listing of all plane surfaces in the 3D Project file.
- Name – the name of the selected/current plane surface.
- Layer – the layer in which the plane surface exists. Click the drop-down box to change the layer for the currently selected plane surface.
- Visible – whether or not plane surface is visible, or if the surface is visible by layer.
- Point on surface – the unique definition of a planar surface. Changing any of these parameters affects the location and slopes of the plane surface.
  - Point on surface: enter the coordinates through which the plane passes.

– Direction of mainfall: enter the direction of mainfall slope.

– Main-fall: enter the percentage of slope along the plane in the direction of the main-fall. Enter a positive value if the plane rises along the main-fall direction.

– Cross-fall: enter the percentage of slope in the direction that is 90° clockwise from the main-fall direction. Enter a positive value if the plane rises in the cross-fall direction.

To view a plane surface, select the surface from the list and click **OK**.

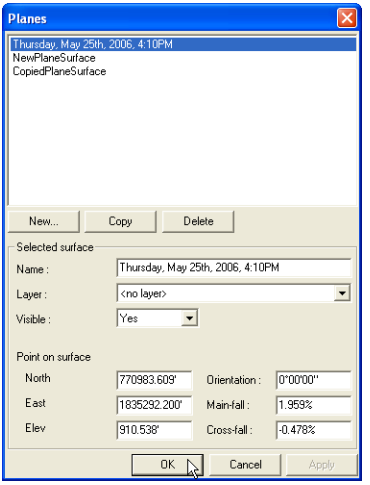

Figure 7-6. Plane Surfaces

Copy a Plane Surface

The copy function provides a way to produce multiple versions of a plane surface, which may be useful for monitoring job progress.

Selecting a plane surface and clicking **OK** will display that version on the Plan View. From there, the plane surface can be edited and exported for use in other files.

1. Click **Plane ▸ Planes** to view all available plane surfaces in the 3D Project.
2. Select the plane surface to copy and click **Copy** (Figure 7-7 on page 7-7).

3. Type a name for the copied plane surface and press **Enter** (Figure 7-7). If needed, click-pause-click a plane surface name to rename a plane surface.

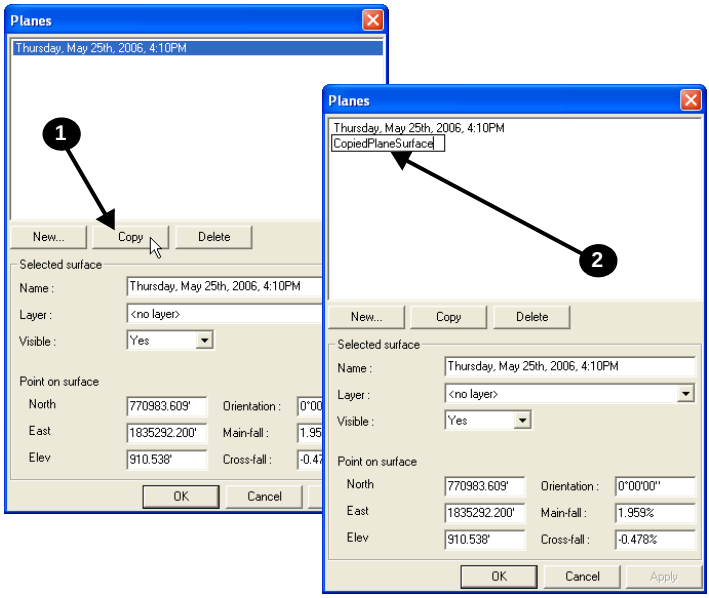

Figure 7-7. Create a Copy of a Plane Surface

Create a New Plane Surface

This process will create a plane surface without a boundary. After creating the surface, you can define a boundary using the polygon selection tool (see “Editing a Plane’s Boundary” on page 7-8).

1. Click **Plane ▸ Planes** and click **New** (Figure 7-8 on page 7-8).
2. Type a name for the copied plane surface and press **Enter** (Figure 7-8 on page 7-8). If needed, click-pause-click a plane surface name to rename a plane surface.

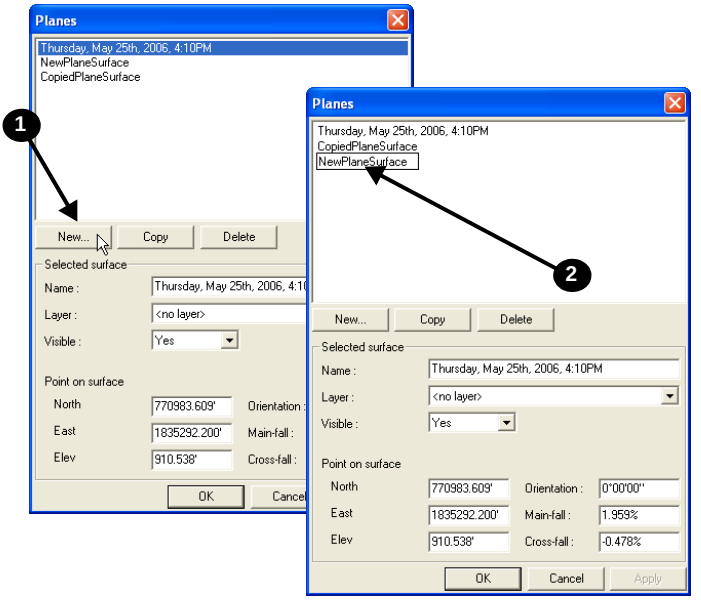

Figure 7-8. Create a New Plane Surface

Editing a Plane's Boundary

The boundary of a plane defines the extents of the region to use in volume comparison calculations. In order to compare the volume between two plane surfaces, at least one of the planes must have a boundary. 3D-Office provides two ways to define the boundary of a plane surface: using the polygon selection tool or choosing an existing closed polygon.

Remove a Current Boundary

A boundary "clips" a plane surface to a defined perimeter. Removing a plane's boundary detaches and deletes the boundary from the plane, infinitely extending the plane surface in 3-dimensional space.

To remove the boundary from the current plane surface, click **Plane ▸ Define plane boundary ▸ Remove current boundary**.

Figure 7-9 illustrates this process. The arrows along the grid lines indicate main-fall and cross-fall direction.

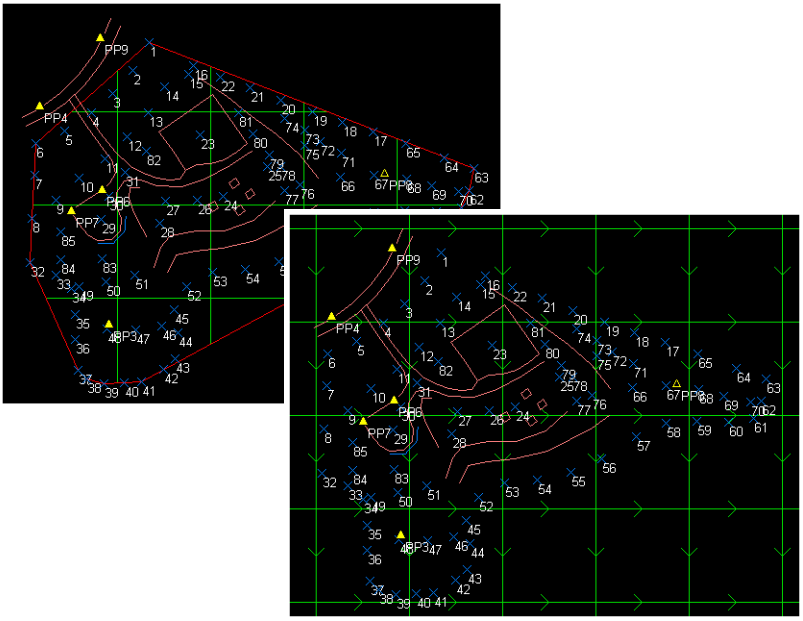

Figure 7-9. Removing the Boundary of a Plane Surface

Define a Boundary using the Selection Polygon

The selection polygon may be used to define the boundary of an existing polygon. Use this tool to re-define the boundary of a plane or to apply a boundary to a plane. To create a plane surface, see “Calculating a Plane Surface” on page 7-4.

1. Using the polygon selection tool, trace a polygon around the area for which to define a boundary. When the polyline becomes a thick white border, click once to close the polygon (Figure 7-10).

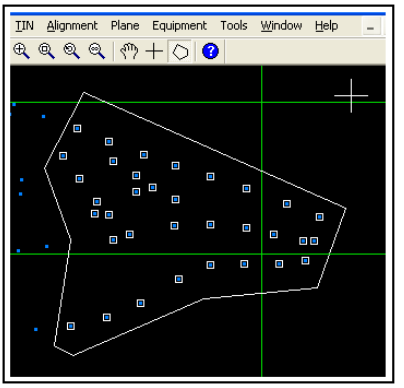

Figure 7-10. Trace Polygon and Calculate Best-fit Surface

2. Click **Plane ▸ Define plane boundary ▸ By selection polygon**. 3D office generates a new boundary for the existing plane surface based on the selection polygon (Figure 7-11).

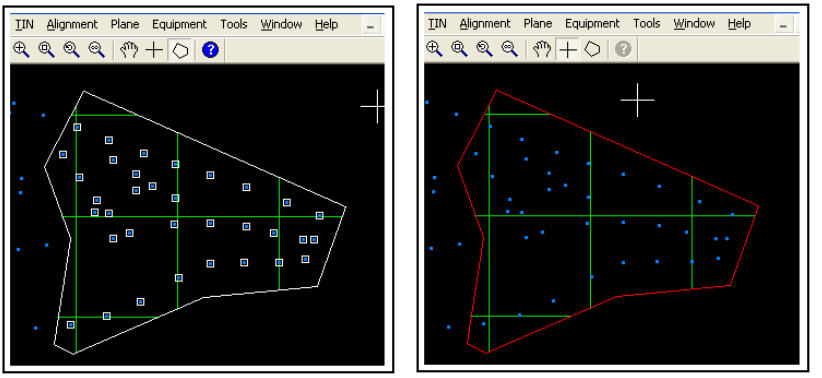

Figure 7-11. Define Boundary and Apply

Define a Boundary by Selecting an Existing Polygon

This function uses an existing polygon to create a boundary. This may be useful when a project already contains one or more closed polygons, such as building pads, that mark the edges of regions that must be graded to planar surfaces.

1. Using the selection tool, select a closed polygon using one of the following methods:
   - If creating a polygon (closed polyline), see "Creating a Polyline" on page 6-7.
   - Click an existing polygon.
2. Click **Plane ▸ Define plane boundary ▸ By selected closed polyline**. 3D-Office calculates a plane surface and applies a boundary based on the chosen polygon (Figure 7-12).

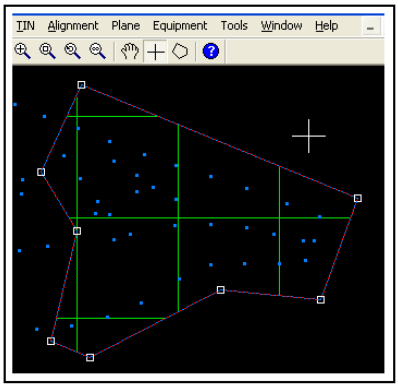

Figure 7-12. Select Polyline and Define Boundary

Notice that the chosen polygon changes color to indicate that it overlays a plane surface boundary.

Deleting a Plane Surface

Only delete a surface when the data it contains will not be needed again. If necessary, save a backup copy of the file before deleting surfaces.

1. Click **Plane ▸ Planes** to view all available plane surfaces in the 3D Project.
2. Select the plane surface to delete and click **Delete**.
3. Click **OK** at the confirmation, then **OK** on the ***Planes*** dialog box to apply the change to the file.

Comparing Surfaces

When comparing surfaces, 3D-Office creates and opens a cut/fill file. Surface comparisons are useful for monitoring excavation or for determining the quantity of material that has been imported to, or exported from, the job site.

Comparing Surfaces in the Current File

The compare surfaces in current file option is only available in 3D Project files, not 3D Plane files.

1. Click **Plane ▸ Compare current plane surface ▸ With other surface in this project**.
2. On the ***Surfaces*** dialog box, select the following and click **OK** (Figure 7-13 on page 7-13):
   - The *Surface of type* from the drop down list, either TIN surface, Road alignment surface, or Plane surface. Only the surface types that exist in the project will be available from this list.
   - The desired surface in the surface list

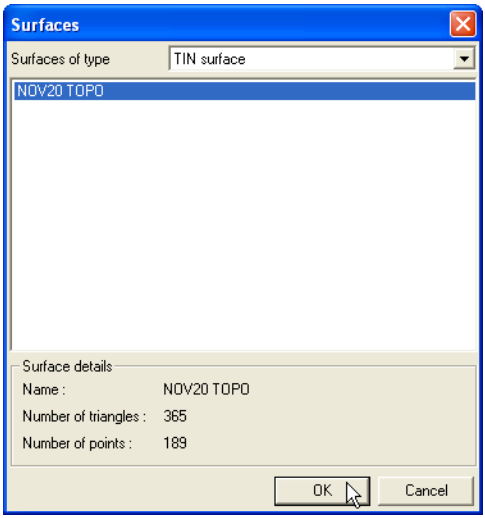

Figure 7-13. Select Surface to Compare

3D-Office compares the two surfaces and opens a Cut/Fill view displaying the compared information (Figure 7-14).

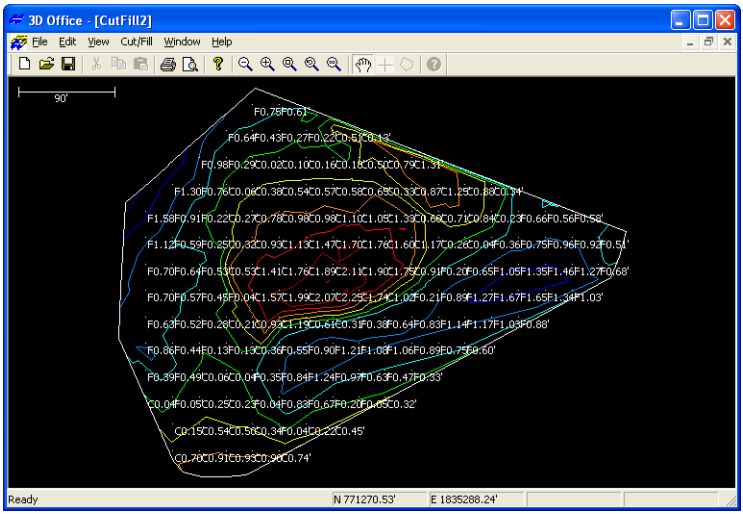

Figure 7-14. Cut/fill View for Compared Surfaces

3. View the cut/fill information. See “Cut/Fill Files” on page 10-1 for details on cut/fill surface files.
   - If needed, re-compare the surface files after making desired adjustments in the original 3D surface files (for example, changing the Direction of mainfall for a plane file).
   - Save the cut/fill file. Click **File ▸ Save as**, navigate to the desired located, type a name for the file, and click **Save**.

Comparing Surfaces in Different Files

1. Click **Plane ▸ Compare plane surface ▸ With 3D surface file** for 3D Plane files or **Plane ▸ Compare current plane surface ▸ With 3D surface file** for 3D Project files.
2. On the ***Open*** dialog box, navigate to the folder in which the file resides, select the *Files of type* from the drop down list (either TN3 files, PL3 files, or RD3 files), select the desired file and click **OK** (Figure 7-15).

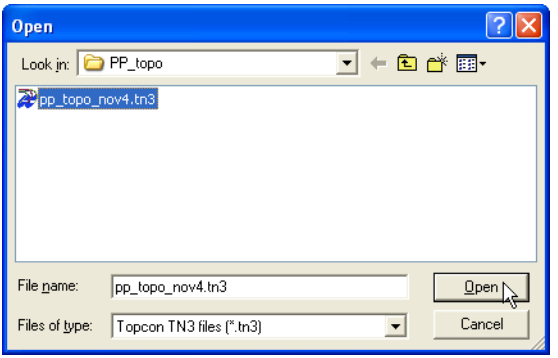

Figure 7-15. Select Surface to Compare

The selected surfaces must overlap, otherwise, no comparison is possible.

3D-Office compares the two surfaces and opens a Cut/Fill file displaying the compared information (Figure 7-16).

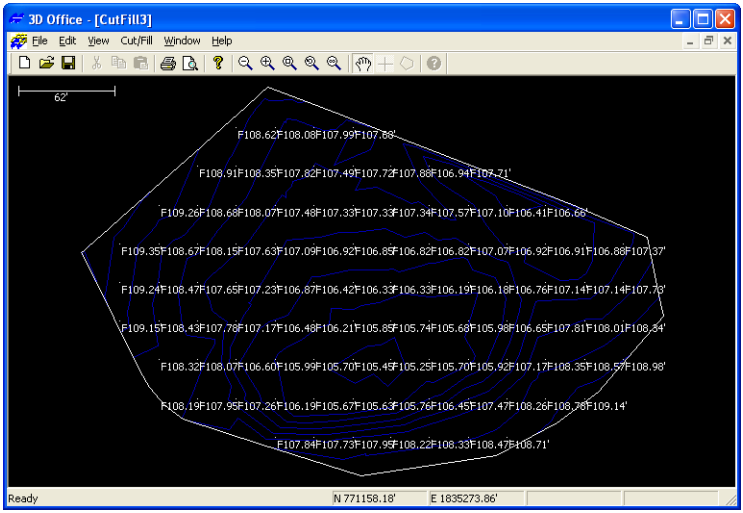

Figure 7-16. Cut/fill File for Compared Surfaces

3. View the cut/fill information. See “Cut/Fill Files” on page 10-1 for details on cut/fill surface files.
   - If needed, re-compare the surface files after making desired adjustments in the original 3D surface files (for example, changing the Direction of mainfall for a plane file).
   - Save the cut/fill file. Click **File ▸ Save as**, navigate to the desired located, type a name for the file, and click **Save**.

Setting Plane Options

The ***Plane Options*** dialog box sets grid lines for showing the orientation of the mainfall and crossfall and determines if the plane's boundary will display on the Plan View.

1. Click **Plane ▸ Options**.
2. Select and enter the following information, then click **OK** (Figure 7-17):
   - Enable *Show main-fall and cross-fall grid lines* to show a grid oriented along the main-fall and cross-fall directions.
     – *Grid interval* sets the spacing between grid lines.
     – *Grid orientation* rotates the grid. Changing the grid orientation value will also change the main-fall and cross-fall directions shown in the ***Plane parameters*** dialog box.
     Changing the grid orientation value in this dialog box will not alter the location or orientation of the plane in 3D space.
   - Enable *Show boundary* to display the boundary.

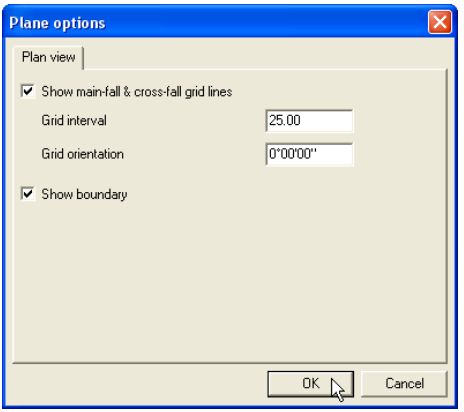

Figure 7-17. Set Plane Surface File Options

Exporting a Plane Surface

If you made changes to a plane file, you can export the changed plane surface to a new plane file or replace a current file with the revised information. This function is the same as the Save as function.

Export versions of the file to track progress.

Exporting to a Plane File

1. Click **Plane ▸ Export plane surface ▸ To 3D plane file** for 3D Plane files or **Plane ▸ Export current plane surface ▸ To 3D plane file** for 3D Project files.
2. On the ***Save As*** dialog box, type a name for the new plane surface file or select a plane file to replace. Click **OK** to export the file (Figure 7-18).

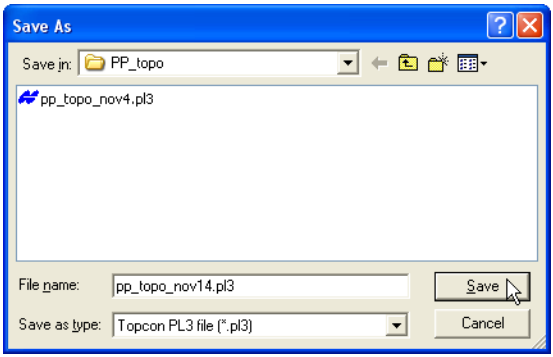

Figure 7-18. Save Plane File

Exporting to a Pocket-3D Controller

To use the plane surface file in the field, export it to a Pocket-3D controller.

1. Connect the Pocket-3D controller to the computer and turn on the controller (see Appendix A for details). Run Pocket-3D on the controller.
2. With a plane surface file open, click **Plane ▸ Export plane surface ▸ To Pocket-3D controller** for 3D Plane files or **Plane ▸ Export current plane surface ▸ To Pocket-3D controller** for 3D Project files.
3. On the ***Pocket-3D files*** dialog box, do one of the following and click **Save** (Figure 7-19):
   - Select an existing file to replace.
   - Enter a new file name or keep the default file name.

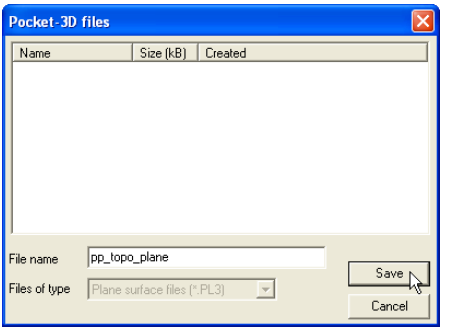

Figure 7-19. Save Plane Surface File to Pocket-3D Controller

Grid Files

A grid surface represents elevation at a specific interval and can display changes in elevation and passes by a machine using a range of colors.

Importing and Opening a Grid File

3D-Office provides an interface for working directly with grids through grid files (*.gd3). Using a grid, you can add, edit, or delete grids, as well as view grid information.

3D-Office imports grids into 3D Project files from 3D grid files (*.gd3).

Importing a Grid

Follow these steps to import a grid from a 3D Grid file into a 3D Project file.

1. With a 3D Project file open, click **Grid ▸ Import grid ▸ From 3D grid file (*.gd3)**.
2. On the ***Open*** dialog box, navigate to the location of the desired file, select it, and click **Open** (Figure 8-1 on page 8-2). The information from the selected file is added to the 3D Project file.

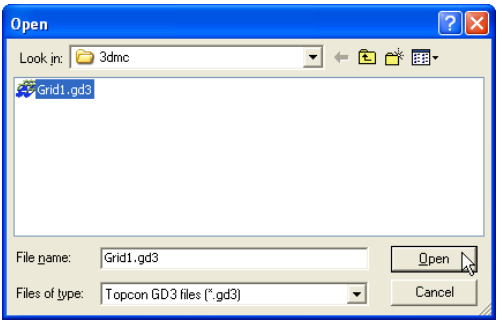

Figure 8-1. Open 3D Grid File

Opening a Grid File

1. To open a control point file click **File ▸ Open**.
2. On the ***Open*** dialog box, navigate to the location of the file, select the file type as Grid surface (*.gd3), select the desired file, and click **Open** (Figure 8-2).

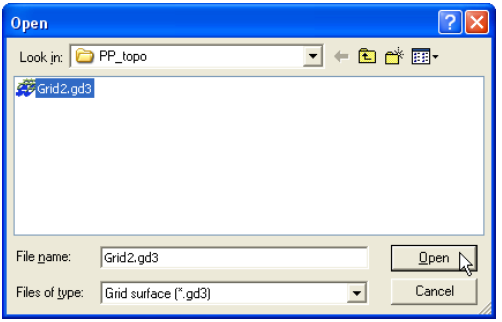

Figure 8-2. Open Grid File

Creating a Grid Surface

A grid surface represents elevation at specific intervals, and two type of grid surfaces can be created in 3D Project files. Using the selection rectangle option, a rectangle is drawn on the surface that is aligned north-south and east-west. Using the rotated rectangle selection, a line is first drawn to show the orientation from start to end, then a rectangle can be drawn with that same orientation.

1. Click **Grid ▸ Grid surfaces ▸ From selection rectangle** or **Grid ▸ Grid surfaces ▸ From rotated rectangle**.
2. On the Plan View, click and draw a rectangle around the area to create a grid surface from. The width and height of the new grid display in the pop-up box (Figure 8-3). When done, the ***New Grid*** dialog box displays.

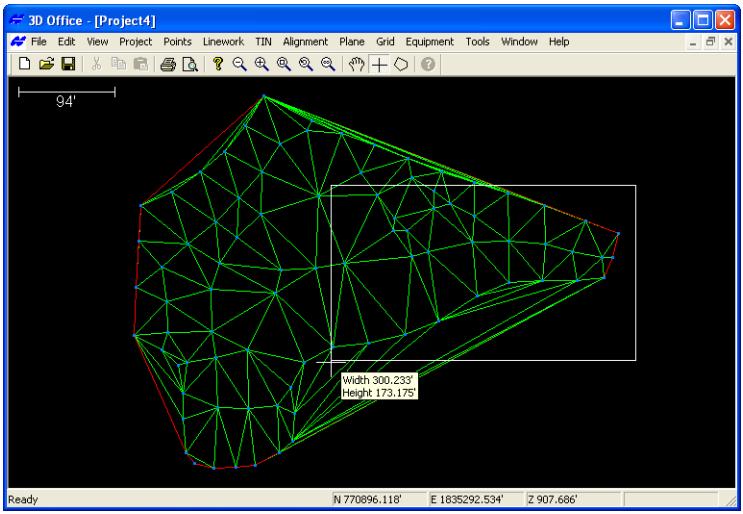

Figure 8-3. Draw Rectangle for New Grid Surface

3. Enter the following parameters for the grid (Figure 8-4 on page 8-4):
   - Name – enter a name for the new grid surface.
   - Layer – select a layer in which to store the grid surface.
   - Visible – select whether or not the grid surface is visible, or if it will be visible by layer.

- Origin X, Origin Y – enter the X and Y origin of the grid surface. This is the point that represents the bottom-left corner of the rectangle.
- Dimension X, Dimension Y – enter the X and Y dimensions of the grid. These values determine the size of the grid surface and affect the Extents X/Extents Y values.
- Orientation – enter the orientation of the grid surface from the bottom left to bottom right corners. This should be the same line drawn for a rotated rectangle grid.
- Interval – enter the interval for grid lines.

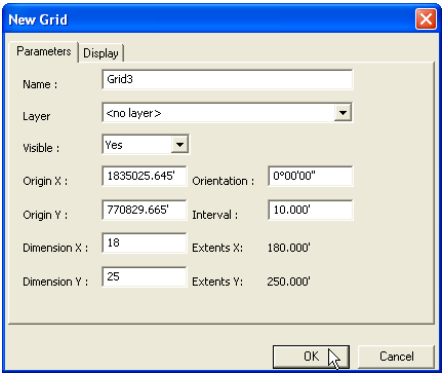

Figure 8-4. Enter New Grid Parameter Information

4. Enter the following display information for the grid (Figure 8-5 on page 8-5):
   - Display – select the display to use for grid surface information.
     – Multi-color elevations will show colored elevation contours at the entered interval.
     – Number of passes will show a different color for each pass of a machine.
     – Previous pass height difference will how the elevation difference between the previous pass and the current pass.
   - Multi-color elevation – for this display, enter the origin (the elevation that appears as center the center contour) and the

interval (the elevation difference between contours) of the colored contour sections. Click **Best Fit** to use the highest and lowest elevation within the grid to calculate the optimal color origin/interval to cover the grid surface evenly.

- Number of passes – for this display, click the button select the color to display for each machine pass.
- Difference from previous pass – for this display, click the button to change the color for up to four passes. Enter the step difference (size of elevation change between each stage) between passes.

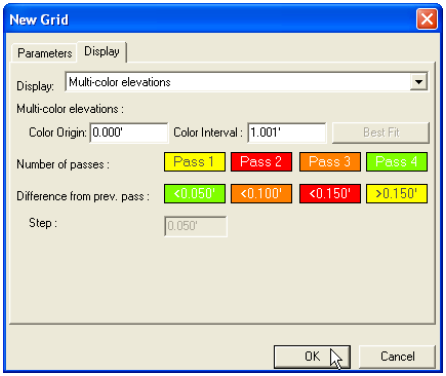

Figure 8-5. Enter New Grid Display Information

5. Click **OK** to save the grid surface.

Viewing Grid Information

To view the 3D Project and 3D Grid grid surfaces, click **Grid ▸ Grid surfaces** or **Grid ▸ Grid properties**. The ***Grid surfaces*** dialog box displays parameter and display information about the selected grid surface (Figure 8-6 on page 8-7).

The *Parameters* tab displays the following settings:

- Name – enter a name for the new grid surface.
- Layer – select a layer in which to store the grid surface.
- Visible – select whether or not the grid surface is visible, or if it will be visible by layer.
- Origin X, Origin Y – enter the X and Y origin of the grid surface. This is the point that represents the bottom-left corner of the rectangle.
- Dimension X, Dimension Y – enter the X and Y dimensions of the grid. These values determine the size of the grid surface and affect the Extents X/Extents Y values.
- Orientation – enter the orientation of the grid surface from the bottom left to bottom right corners. This should be the same line drawn for a rotated rectangle grid.
- Interval – enter the interval for grid lines.

The *Display* tab contains the following settings:

- Display – select the display to use for grid surface information.
  - Multi-color elevations will show colored elevation contours at the entered interval.
  - Number of passes will show a different color for each pass of a machine.
  - Previous pass height difference will how the elevation difference between the previous pass and the current pass.
- Multi-color elevation – for this display, enter the origin (the elevation that appears as center the center contour) and the interval (the elevation difference between contours) of the

colored contour sections. Click **Best Fit** to use the highest and lowest elevation within the grid to calculate the optimal color origin/interval to cover the grid surface evenly.

- Number of passes – for this display, click the button select the color to display for each machine pass.
- Difference from previous pass – for this display, click the button to change the color for up to four passes. Enter the step difference (size of elevation change between each stage) between passes.

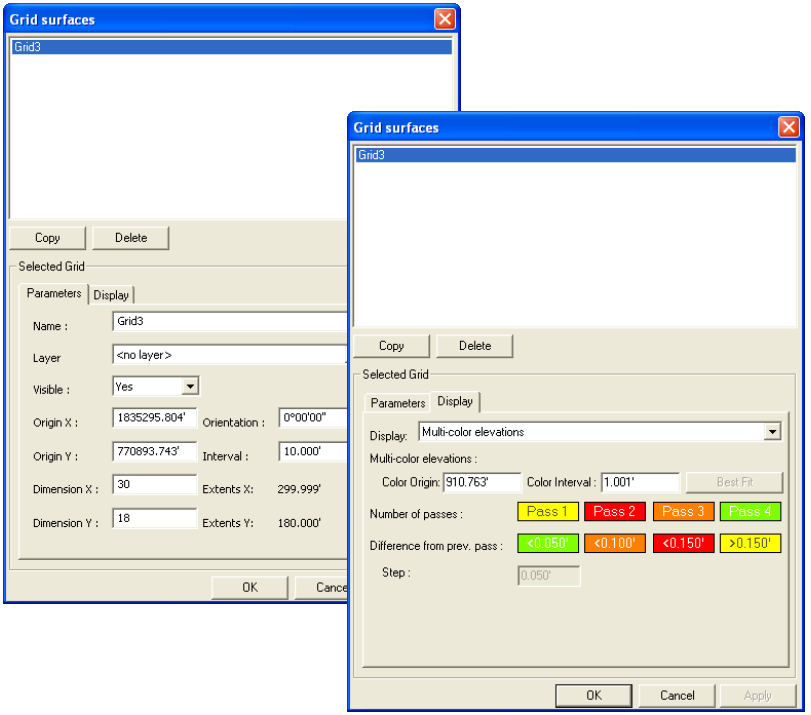

Figure 8-6. Grid Surfaces

Editing a Grid Surface

1. On the ***Grid surfaces*** dialog box, select the grid surface to edit (Figure 8-6).
2. Change or edit the following parameters as needed:
   - The name of the grid surface.
   - The layer in which the grid surface exists.
   - If the grid surface is visible, not visible, or visible by layer.
   - The color of the triangles, perimeter, or contours of the TIN surface (click the element's button and select a new color).
   - The origin of the grid surface.
   - The size of the grid surface (the also affects the extents).
   - The orientation of the grid surface.
   - The interval of the grid lines.
3. Change or edit the following display information as needed:
   - If using multi-color elevation display type, the color origin and/or interval.
   - If using the number of passes display type, the color for up to four passes.
   - f using the difference from previous pass display type, the color for up to four passes. Enter the step difference between passes.
4. Click **OK** to save the changes and apply then to the selected surface.

Copying a Grid Surface

The copy function provides a way to produce multiple versions of a grid surface, which may be useful for reducing an existing grid into one or more sub-regions. Selecting a grid surface and clicking **OK** will display the grid in the design view.

1. On the ***Grid surfaces*** dialog box, select the grid surface to copy and click **Copy** (Figure 8-7).
2. Type a unique name for the new grid surface and press **Enter** (Figure 8-7).

3. Make any desired changes as described in “Editing a Grid Surface” on page 8-8.
4. To view or edit the copied grid surface, select it and click **OK**.

From here, you can make changes to the grid surface, then export it for use in another file.

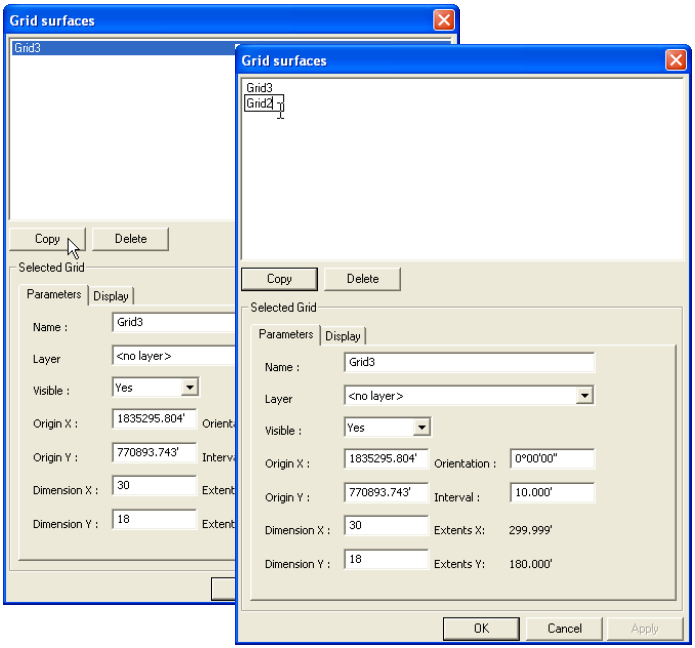

Figure 8-7. Copy and Name Grid Surface

Deleting a Grid Surface

Only delete a surface when the data it contains will never be needed again. If necessary, save a backup copy of the file before deleting surfaces.

NOTICE Deleting a surface will also delete all of its contents.

1. On the ***Grid surfaces*** dialog box, select the grid surface to delete and click **Delete**.
2. Click **OK** to confirm the deletion (Figure 8-8).

To undo the deletion, click **Edit ▸ Undo edit grid surfaces** or press **Ctrl+Z**.

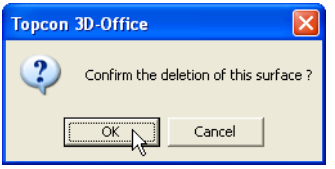

Figure 8-8. Delete Grid Surface

Loading a Grid Surface from a TIN Surface

3D-Office can load the 3D Grid surface with interpolated data from a TIN surface. A TIN surface must exist in the 3D Project file. You can select to either match the color origin/interval from the TIN file, or to enter a new color origin/interval for the Grid surface.

1. Click **Grid ▸ Load current grid ▸ Load from TIN surface**.
2. Select the TIN surface to load grid data from.
3. Select the coloration to apply to the grid and click **OK** (Figure 8-9 on page 8-11).
   - Match to TIN color origin and enter the color origin
   - Match to TIN color interval and enter the color interval

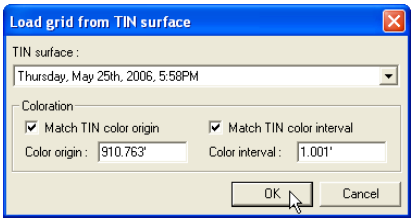

Figure 8-9. Load Grid Information from TIN Surface

The Grid surface will load with information from the TIN surface (Figure 8-10).

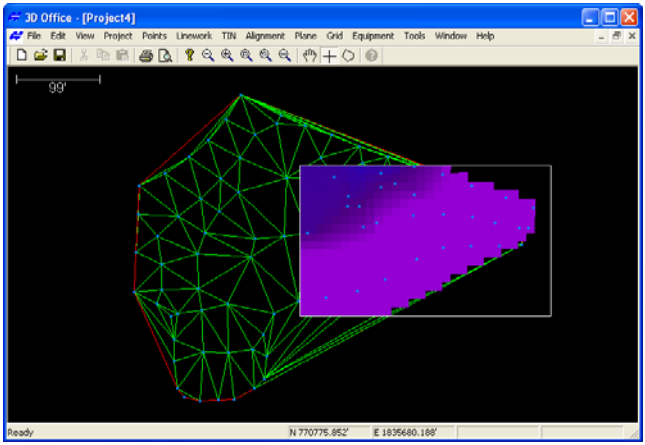
3D Office - [Project4]
File Edit View Project Points Linework TIN Alignment Plane Grid Equipment Tools Window Help
99'
Ready

Figure 8-10. Grid Surface Loaded with TIN Information

Removing Grid Data To clear loaded TIN surface grid information, click **Grid ▸ Load current grid ▸ Remove all grid data**. Click OK at the confirmation.

Exporting a Grid Surface

If you made changes to a grid surface, you can export the changed surface to a new grid surface file, or replace an existing file with the new information.

Export versions of the file to track progress.

1. Click **Grid ▸ Export current grid ▸ To 3D grid file (*.gd3)**.
2. On the ***Save As*** dialog box, do one of the following (Figure 8-11):
   - To export to an existing TIN file, navigate to the location of the file and select it, then click **Save** (the contents of the existing file are replaced).
   - To save to a new file, navigate to the desired folder, type a name for the new file, and click **Save**.

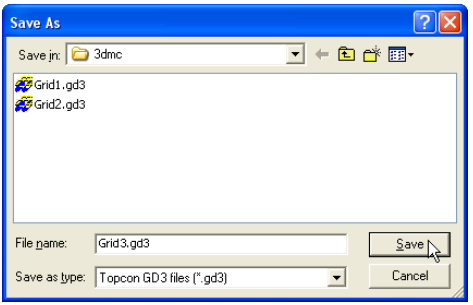

Figure 8-11. Save Grid Surface File

The selected grid surface overwrites the existing file or creates a new 3D Grid surface file.